

BRONNELYS

ADEDAYO, O.A. 1999. Differential effectiveness by gender of instructional methods on achievement in mathematics at tertiary level. *Educational studies in mathematics*, 37(1):83-91.

ADLER, J. 2005. Mathematics for teaching: what is it and why is it important that we talk about it? *Pythagoras*, 62:2-11.

ADLER, J. & DAVIS, Z. 2006. Opening another black box: researching mathematics for teaching in mathematics teacher education. *Journal for research in mathematics education*, 37(4):270-296.

ADLER, J., SLONIMSKY, L. & REED, Y. 2002. Subject-focused INSET and teachers' conceptual knowledge-in-practice. (In Adler, J. & Reed, Y., eds. *Challenges of teacher development*. Pretoria: Van Schaik. p. 135-152.)

AKKOÇ, H. & TALL, D.O. 2003. The function concept: comprehension and complication. (In *Proceedings of the Day Conference of British Society of Research on Learning of Mathematics*. Sheffield: Hallam University. p. 1-6.)

ALKHATEEB, H. & HAMMOUDI, L. 2006. Attitudes toward and approaches to learning first-year university mathematics. *Perceptual and motor skills*, 103:115-120.

AMATO, S.A. 2004. Improving student teachers' attitudes to mathematics. (In Chick, H.L. & Vincent, J.L., eds. *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*, 2:25-32.)

ARMSTRONG, P.K. & CROFT, A.C. 1999. Identifying the learning needs in mathematics of entrants to undergraduate engineering programmes in an English university. *European journal of engineering education*, 24(1):59-71.

ARY, D., JACOBS, L.C., RAZAVIEH, A. & SORENSEN, C. 2006. Introduction to research in education. 7th ed. Belmont, Calif.: Thomson. 670 p.

ATTORPS, I. 2007. Concept definition and concept image in the case of equations. <http://www.distans.hkr.se/rikskonf/Grupp%202/Attorps.pdf> Datum van gebruik: 23 Sept. 2007.

BABBIE, E. & MOUTON, J. 2001. The practice of social research. (South African edition.) Cape Town: Oxford University Press. 674 p.

BACHMAN, L.F. 2004. Statistical analyses for language assessment. Cambridge: Cambridge University Press. 364 p.

BAKER, W., CZARNOCHA, B. & PRABHU, V. 2004. Procedural and conceptual knowledge in mathematics. <http://www.pmena.org/2004/pdfs/groups/conceptual.doc> Datum van gebruik: 15 Feb. 2006.

BALACHEFF, N. & KAPUT, J.J. 1996. Computer-based learning environments in mathematics. (In Bishop, A.J., Clements, K., Keitel, C., Kilpatrick, J. & Laborde, C., eds. International handbook of mathematics education, Part 1. Dordrecht: Kluwer. p. 469-501.)

BALL, D. 1988. Unlearning to teach mathematics. *For the learning of mathematics*, 8(1):40-48, February.

BALL, D.L. 1990. The mathematical understandings that prospective teachers bring to teacher education. *Elementary school journal*, 90(4):449-466, March.

BALL, D.L. & BASS, H. 2000. Interweaving content and pedagogy in teaching and learning to teach: knowing and using mathematics. (In Boaler, J., ed. Multiple perspectives on mathematics teaching and learning. Westport, CT.: Ablex. p. 83-104.)

BALL, D.L., BASS, H. & HILL, H.C. 2004. Knowing and using mathematical knowledge in teaching: learning what matters. (In Buffgler, A. & Lausch, R., eds. Proceedings for the 12th Annual Conference of the South African Association for Research in Mathematics, Science and Technology Education. Durban: SAARMSTE. p. 51-65.)

BALL, D.L., HILL, H.C. & BASS, H. 2005. Knowing mathematics for teaching. *American educator*, 14-17; 20-22; 43-46, Fall.

BALL, D.L., LUBIENSKI, S.T. & MEWBORN, D.S. 2001. Research on teaching mathematics: the unsolved problem of teachers' mathematical knowledge. (In Richardson, V., ed. Handbook of research on teaching. Washington, D.C.: AERA. p. 433-456.)

BALL, L. & STACEY, K. 2005. Teaching strategies for developing judicious technology use. (In Masalski, W.J. & Elliot, P.C., eds. Technology-supported mathematical learning environments. NCTM Yearbook. Reston, Va. p. 3-15.)

BANDALOS, D.L., YATES, K. & THORNDIKE-CHRIST, T. 1995. Effects of math self-concept, perceived self-efficacy and attributions for failure and success on test anxiety. *Journal of educational psychology*, 87(4):611-623.

BANDURA, A. 1977. Self-efficacy: toward a unifying theory of behavioural change. *Psychological review*, 84(2):191-215.

BANDURA, A. 1986. Social foundation of thought and action. A social cognitive theory. Upper Saddle River, N.J.: Prentice Hall. 617 p.

BARABASH, M., GUBERMAN-GLEBOV, R. & BARUCH, R. 2003. Decision-making in construction of courses combining classroom-based and internet-based learning and teaching strategies in mathematics teachers' education. *Journal of educational media*, 28 (2/3):147-163, October.

BARR, R.B. & TAGG, J. 1995. From teaching to learning: a new paradigm for undergraduate education. <http://critical.tamucc.edu/~blalock/readins/tch2learn.htm> Datum van gebruik: 15 Aug. 2007.

BARTON, D. 2003. Using technology to teach the transformation of graphs. *Micromath*, 19(2):12-15, Summer.

BATTISTA, M. 1994. Teachers beliefs and the reform movement in mathematics education. *Phi Delta Kappan*, 75(6):462-467, February. Beschikbaar: Academic Search Premier. Datum van gebruik: 20 Aug. 2007.

BEDNARZ, N., KIERAN, C. & LEE, L., eds. 1996. Approaches to algebra: perspectives for research and teaching. London: Kluwer.

BEGG, A. 1999. Constructivism: an overview and some implications. (Paper presented at a seminar at the Auckland College of Education, May.) www.education.auckland.ac.nz/.../education/docs/word/research/foed_paper/issue4/ACE_Paper_3_Issue_4.doc Datum van gebruik: 13 Aug. 2007.

BEN-HUR, M. 2006. Concept-rich mathematics instruction: building a strong foundation for reasoning and problem solving. <http://www.ascd.org/portal/site/ascd/menuitem.71d101a2f7c208cdeb3ffdb62108a0c/> Datum van gebruik: 10 Sept. 2007.

BERGESON, T., FITTON, R., BYLSMA, P., NEITZEL, B. & STINE, M.A. 2000. Teaching and learning mathematics: using research to shift from the yesterday mind to the tomorrow mind. <http://www.k12.wa.us/research/pubdocs/pdf/MathBook.pdf> Datum van gebruik: 13 Junie 2006.

BERNSTEIN, A. 2007. Maths and science teaching: a test SA can't afford to fail. *Business Day*: 11, 4 Oct. http://www.cde.org.za/article.php?a_id=266&PHPSESSID=f22f2cd00b5f30492d70e1467215d7ca Datum van gebruik: 10 Jan. 2008.

BERRY, J.S. & NYMAN, M.A. 2003. Promoting students' graphical understanding of the calculus. *Journal of mathematical behaviour*, 22:481-497.

BETTS, P. 2005. Toward how to add an aesthetic image to mathematics education. *International journal for mathematics teaching and learning*, April. <http://www.cimt.plymouth.ac.uk/journal/betts.pdf> Datum van gebruik: 25 Julie 2007.

BIGGS, J. 1996. Enhancing teaching through constructive alignment. *Higher education*, 32:347-364, October.

BRADY, P. & BOWD, A. 2005. Mathematics anxiety, prior experience and confidence to teach mathematics among pre-service education students. *Teachers and teaching: theory and practice*, 11(1):37-46, February.

BRANSFORD, J.D., BROWN, A.L. & COCKING, R.R. 1999. How people learn: brain, mind, experience and school. Washington, D.C.: National Academy Press. 374 p.

BREIDENBACH, D., DUBINSKY, E., HAWKS, J. & NICHOLS, D. 1992. Development of the process conception of function. *Educational studies in mathematics*, 23(3):247-285.

BRODIE, K. 2001. Changing practices, changing knowledge: towards mathematical pedagogical content knowledge in South Africa. *Pythagoras*, 54:17-25, April.

BRODIE, K. 2004. Re-thinking teachers' mathematical knowledge: a focus on thinking practices. *Perspectives in education*, 22(1):65-80, March.

BROPHY, J. 1991. Conclusion. (In Brophy, J., ed. *Advances in research on teaching: teachers' knowledge of subject matter as it relates to their teaching practice*, v. 2. Greenwich, Conn.: JAI Press. p. 349-364.)

BROWN, C.A. & BORKO, H. 1992. Becoming a mathematics teacher. (In Grouws, D.A., ed. *Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics*. New York: Macmillan/NCTM. p. 209-239.)

BROWN, C.A., CARPENTER, T.P., KOUBA, V.L., LINDQUIST, M.M., SILVER, E.A. & SWAFFORD, J.O. 1988. Secondary school results for the Fourth NAEP Mathematics assessment: algebra, geometry, mathematical methods and attitudes. *Mathematics teacher*, 81(5):337-347, 397, May.

BROWN, J.S., COLLINS, A. & DUGUID, P. 1989. Situated cognition and the culture of learning. *Educational researcher*, 18(1):32-42, January-February.

BRYAN, T.J. 1999. The conceptual knowledge of preservice secondary mathematics teachers: how well do they know the subject matter they will teach? Issues in the undergraduate mathematics preparation of school teachers. *The journal*, 1: Content knowledge. www.k-12prep.mathttu.edu/journal/contentknowledge Datum van gebruik: 15 Aug. 2007.

BYRNES, J. & WASIK, B. 1991. Role of conceptual knowledge in mathematical procedural learning. *Developmental psychology*, 27(5):777-786.

CARMODY, G., GODFREY, S. & WOOD, L. 2006. Diagnostic tests in a first year mathematics subject. www.science.uniserve.edu.au/pubs/procs/2006/carmody.pdf Datum van gebruik: 2 Julie 2008.

CARPENTER, T.P. & LEHRER, R. 1999. Teaching and learning with understanding. (In Fennema, E. & Romberg, T.A., eds. *Mathematics classrooms that promote understanding*. Mahwah, N.J.: Erlbaum. p. 19-32.)

CARPENTER, T.P. & ROMBERG, T.A. 2004. Powerful practices in mathematics and science. Madison, Wis.: National Center for Improving Student Learning and Achievement in Mathematics and Science. 48 p.

CARTER, G. & NORWOOD, K.S. 1997. The relationship between teacher and student beliefs in mathematics. *School science and mathematics*, 97(2):62-67, February.

CHARALAMBOUS, C., PHILIPPOU, G. & KYRIAKIDES, L. 2002. Towards understanding teachers' philosophical beliefs about mathematics. (In Cockburn, A.D. & Nardi, E., eds. Proceedings of the 26th Conference of the International Group for the Psychology of Mathematics Education, 2:217-224.)

CLARK, C.M. & PETERSON, P.L. 1986. Teachers' thought processes. (In Wittrock, M.C., ed. Handbook of research on teaching. 3rd ed. New York: Macmillan. p. 255-296.)

CLEMENT, L. 2001. What do students really know about functions? *Mathematics teacher*, 94(9):745-748, December.

COBB, P., WOOD, T., YACKEL, E. & McNEAL, B. 1992. Characteristics of classroom mathematics traditions: an interactional analysis. *American educational research journal*, 29(3):573-604, Fall.

COBB, P. & YACKEL, E. 1998. A constructivist perspective on the culture of the mathematics classroom. (In Seeger, F., Voigt, J. & Waschescio, U., eds. The culture of the mathematics classroom. Cambridge: Cambridge University Press. p. 159-190.)

COHEN, L., MANION, L. & MORRISON, K. 2007. Research methods in education. 6th ed. London: Routledge. 638 p.

COONEY, T.J. 1988. The issue of reform: what have we learned from yesteryear? *Mathematics teacher*, 81(5):352-363, May.

COONEY, T.J., SHEALY, B.E. & ARVOLD, B. 1998. Conceptualizing belief structures of preservice secondary mathematics teachers. *Journal for research in mathematics education*, 29(3):306-333.

CORNELL, C. 1999. I hate math! I couldn't learn it, and I can't teach it! *Childhood education*, Summer.

http://findarticles.com/p/articles/mi_qa3614/is_199907/ai_n8870612/print?tag=artBody:col1 Datum van gebruik: 26 Jun 2008.

CORNO, L. 1992. Encouraging students to take responsibility for their own learning. *Elementary school journal*, 93(1):69-83, September.

CRAWFORD, K., GORDON, S., NICHOLAS, J. & PROSSER, M. 1994. Conceptions of mathematics and how it is learned. *Learning and instruction*, 4:331-345.

CRESWELL, J.W. 2003. Research design. Qualitative, quantitative and mixed methods approaches. 2nd ed. Belmont, Calif.: Sage. 245 p.

CRESWELL, J.W., PLANO CLARK, V.L., GUTMANN, M.L. & HANSON, W.E. 2003. Advanced mixed methods research designs. (In Tashakkori, A. & Teddlie, C., eds. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif.: Sage. p. 209-240.)

CRECHLEY, P. C. & GALBRAITH, P. 2002. Mathematics or computers? Confidence or motivation? How do these relate to achievement? (In Proceedings of the 2nd international Conference on the Teaching of Mathematics, Hersonissos, Crete, Greece. 1-6 July.) <http://www.math.uoc.gr/~ictm2/Proceedings/pap318.pdf> Datum van gebruik: 25 Jan. 2008.

CRECHLEY, P. C. & HARMAN, C.J. 2001. Balancing the scales of confidence: computers in early undergraduate mathematics learning. http://eprints.usq.edu.au/1770/1/Delta'01_Cretchley&Harman_Pre-print.pdf Datum van gebruik: 25 Jan 2008.

DABBAGH, N. 2007. The Instructional Design Knowledge Base. George Mason University, Instructional Technology Program. <http://classweb.gmu.edu/ndabbagh/Resources/IDKB/index.htm> Datum van gebruik: 20 Aug. 2007.

DAVIS, B. & SIMMT, E. 2006. Mathematics-for-teaching: an ongoing investigation of the mathematics that teachers (need to) know. *Educational studies in mathematics*, 61: 293-319.

DAVIS, J.D. 2005. Connecting procedural and conceptual knowledge of functions. *Mathematics teacher*, 99(1):36-39, August.

DAVIS, R.B. & MAHER, C.A. 1997. How students think: the role of representations. (In English, L.D., ed. Mathematical reasoning: analogies, metaphors and images. Mahwah, N.J.: Erlbaum. p. 93-115.)

DE CORTE, E., VERSCHAFFEL, L. & OP'T EYNDE, P. 2000. Self-regulation: a characteristic and a goal of mathematics education. (In Boekaerts, M., Pintrich, P.R. & Zeidner, M., eds. Handbook of self-regulation. San Diego: Academic Press. p. 687-726.)

DE BRUIN, K. 2007. The relationship between personality traits and self-directed learning readiness in higher education students. *South African journal of higher education*, 21(2):228-240.

DE LANGE, J. 1992. Higher order (un-)teaching. (In Wirszup, L. & Streit, R., eds. Developments in school mathematics education around the world. Reston, Va.: National Council of Teachers of Mathematics. 3:47-72.)

DE LANGE, J. 1996. Using and applying mathematics in education. (In Bishop, A.J., Clements, K., Keitel, C., Kilpatrick, J. & Laborde, C., eds. International handbook of mathematics education, Part 1. Dordrecht: Kluwer. p. 49-97.)

DEMANA, F., SCHOEN, H.L. & WAITS, B. 1993. Graphing in the K-12 curriculum: the impact of the graphing calculator. (In Romberg, T.A., Fennema, E. & Carpenter, T.P., eds. Integrating research on the graphical representation of functions. Hillsdale, N.J.: Erlbaum. p. 11-39.)

DeMAROIS, P. 1996. Beginning algebra students' images of the function concept. (On-Line Proceedings of the Twenty-Second Annual Conference of the American Mathematical Association of Two-Year Colleges. 12 p.) www.amatyc.org/Old/Proceedings/LongBeach22/DeMarois.pdf Datum van gebruik: 13 Sept. 2007.

DeMAROIS, P. & TALL, D. 1999. Function: organizing principle or cognitive root. (In Proceedings of the 23rd Conference of the International Group for the Psychology of Mathematics Education, Haifa, Israel, 2: 257-284.) <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot1999e-demarois-pme.pdf>) Datum van gebruik: 13 Sept 2007.

DE VILLIERS, M. (profmd@mweb.co.za) 2006. . Sept News. E-pos aan: Roux, A. (Annalie.Roux@nwu.ac.za) 17 September.

DEW, K.M.H., GALASSI, J.P. & GALASSI, M.D. 1984. Math anxiety: relation with situational test anxiety, performance, psychological arousal and math avoidance behaviour. *Journal of counselling psychology*, 31(4):580-583.

DIENER, C.I. & DWECK, C.S. 1978. An analysis of learned helplessness: continuous changes in performance, strategy, and achievement cognitions following failure. *Journal of personality and social psychology*, 36(5):451-462, May.

DEPARTMENT OF EDUCATION *kyk* SOUTH AFRICA

DOSSEL, S. 1993. Maths anxiety. *Australian mathematics teacher*, 49(1):4-8.

DOSSEY, J.A., McCRONE, S., GIORDANO, F.R. & WEIR, M.D. 2002. Mathematics methods and modelling for today's mathematics classroom: a contemporary approach for teaching grades 7-12. Pacific Grove, Calif.: Brooks/Cole. 632 p.

DRAPER, R.J. 2002. School mathematics reform, constructivism, and literacy: a case for literacy instruction in the reform-oriented math classroom. *Journal of adolescent & adult literacy*, 45(6):520-529, March.

DREYFUS, T. 1990. Advanced mathematical thinking. (In Nesher, P. & Kilpatrick, J., eds. Mathematics and cognition: a research synthesis by the international group for the psychology of mathematics education. Cambridge: Cambridge University Press. p. 113-133.)

DREYFUS, T. & EISENBERG, T. 1982. Intuitive functional concepts: a baseline study on intuitions. *Journal for research in mathematics education*, 13(5):360-380, November.

DRIER, H.S. 2001. Teaching and learning mathematics with interactive spreadsheets. *School science and mathematics*, 101(4):170-179, April.

DRISCOLL, M.P. 2005. Psychology of learning for instruction. 3rd ed. Boston, Mass.: Pearson. 476 p.

DUBINSKY, E. 1991. Reflective abstraction in advanced mathematical thinking. (In Tall, D., ed. Advanced mathematical thinking. Dordrecht: Kluwer. p. 95-123.)

DUBINSKY, E. 2000. Mathematical literacy and abstraction in the 21st century. *School science and mathematics*, 100(6):289-297, October.

DUBINSKY, E. & HAREL, G. 1992. The nature of the process conception of function. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 85-106.)

DUGDALE, S. 1993. Functions and graphs-perspectives on student thinking. (In Romberg, T.A., Fennema, E. & Carpenter, T.P., eds. Integrating research on the graphical representation of functions. Hillsdale, N.J.: Erlbaum. p. 101-130.)

DUGMORE, C. 2007. Percentage slightly down, but actual numbers up. <http://www.info.gov.za/speeches/2007/07122815451001.htm> Datum van gebruik: 14 Jan. 2008.

ECCLES, J.S., WIGFIELD, A., MIDGLEY, C., REUMAN, D., MacIVER, D. & FELDLAUER, H. 1993. Negative effects of traditional middle schools on students' motivation. *Elementary school journal*, 93(5):553-574, May.

EISELEN, R.J. 2006. Predicting achievement in mathematics at tertiary level. Johannesburg: UJ. (Thesis - D. Phil.) <http://etd.rau.ac.za/theses/available/etd-02232007-151645/> Datum van gebruik: 19 Feb.2008.

EISELEN, R. & GEYSER, H. 2003. Factors distinguishing between achievers and at risk students: a qualitative and quantitative synthesis. *South African journal of higher education*, 17(2): 118-130.

EISENBERG, T. 1992. On the development of a sense for functions. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 153-174.)

EISENHART, M., BORKO, H., UNDERHILL, R., BROWN, C., JONES, D. & AGARD, P. 1993. Conceptual knowledge falls through the cracks: complexities of learning to teach mathematics for understanding. *Journal for research in mathematics education*, 24(1):8-40.

ELLIS, M.W. & BERRY, R.Q. 2005. The paradigm shift in mathematics education: explanations and implications of reforming conceptions of teaching and learning. *Mathematics educator*, 15(1):7-17.

ENGELBRECHT, J., HARDING, A. & POTGIETER, M. 2005. Undergraduate students' performance and confidence in procedural and conceptual mathematics. <http://ridcully.up.ac.za/muti/conceptualmath.pfd> Datum van gebruik: 11 April 2006.

ERBAS, A.K., LEDFORD, S.D., ORRILL, C.H. & POLLY, D. 2005. Promoting problem solving across geometry and algebra by using technology. *Mathematics teacher*, 98(9):599-603, May.

ERNEST, P. 1989a. The impact of beliefs on the teaching of mathematics. (In Ernest, P., ed. *Mathematics teaching: the state of the art*. New York: Falmer Press. p. 249-254.)

ERNEST, P. 1989b. The knowledge, beliefs and attitudes of the mathematics teacher: a model. *Journal of education for teaching*, 15(1):13-33.

ERNEST, P. 1991. *The philosophy of mathematics education*. London: Falmer Press. 329 p.

ERTMER, P.A. & NEWBY, T.J. 1993. Behaviorism, cognitivism, constructivism: comparing critical features from an instructional design perspective. *Performance improvement quarterly*, 6(4):50-72.

ERTMER, P.A. & NEWBY, T.J. 1996. The expert learner: strategic, self-regulated and reflective. *Instructional science*, 24:1-24.

EVEN, R. 1990. Subject matter knowledge for teaching and the case of functions. *Educational studies in mathematics*, 21:521-544.

EVEN, R. 1993. Subject matter knowledge and pedagogical content knowledge: prospective secondary teachers and the function concept. *Journal for research in mathematics education*, 24(2):94-116.

EVEN, R. 1998. Factors involved in linking representations of functions. *Journal of mathematical behaviour*, 17(1):105-121.

FAUGHN, A.P. & MURPHY, T.F. 2007. Using interactive geometry software based instruction in a college trigonometry course. <http://www.rume.org/crume2007/papers/faughn-murphy> Datum van gebruik: 10 Junie 2008.

FENNEMA, E. 1989. The study of affect and mathematics: a proposed generic model for research. (In McLeod, D.B. & Adams, V.M., eds. *Affect and mathematical problem solving: a new perspective*. New York: Springer. p. 205-219.)

FENNEMA, E. & FRANKE, M.L. 1992. Teachers' knowledge and its impact. (In Grouws, D.A., ed. *Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics*. New York: Macmillan/NCTM. p. 147-164.)

FENNEMA, E., PETERSON, P.L., CARPENTER, T.P. & LUBINSKI, C.A. 1990. Teachers' attributions and beliefs about girls, boys and mathematics. *Educational studies in mathematics*, 21:55-69.

FENSTERMACHER, G.D. 1986. Philosophy of research on teaching: three aspects. (In Wittrock, M. C., ed. *Handbook of research on teaching*. 3rd ed. New York: Macmillan. p. 37-49.)

FERNÁNDEZ, E. 2005. Understanding functions without using the vertical line test. *Mathematics teacher*, 99(2):96-100, September.

FEY, J.T. 1989. School algebra for the year 2000. (In Wagner, S. & Kieran, C., eds. *Research issues in the learning and teaching of algebra*. Reston, Va: National Council of Teachers of Mathematics. p. 199-213.)

FIORE, G. 1999. Math-abused students: are we prepared to teach them? http://www.ccbcmd.edu/supportservices/dundalk/w_gallery/gregfiore.html Datum van gebruik: 28 Sept 2008.

FIRESTONE, W.A. 1993. Alternative arguments for generalizing from data as applied to qualitative research. *Educational researcher*, 22(4):16-23, May.

FLAVELL, J.H. 1976. Metacognitive aspects of problem solving. (In Resnick, L.B., ed. *The nature of intelligence*. Hillsdale, N.J.: Erlbaum. p. 231-236.)

FLAVELL, J.H. 1979. Metacognition and cognitive monitoring: a new area of cognitive-developmental inquiry. *American psychologist*, 34(10):906-911, October.

FLORES, A., KNAUP, J.E., MIDDLETON, J.A. & STALEY, F.A. 2002. Integration of technology, science and mathematics in the middle grades: a teacher preparation program. *Contemporary issues in technology and teacher education*, 2(1).
<http://www.citejournal.org/vol2/iss1/mathematics/article1.pdf> Datum van gebruik: 14 Nov. 2004.

FOSNOT, C.T. 1996. Constructivism: a psychological theory of learning. (In Fosnot, C.T., ed. *Constructivism: theory, perspectives and practice*. New York: Columbia University, Teachers College. p. 8-33.)

FOSS, D.H. & KLEINSASSER, R.C. 1996. Pre-service elementary teachers' views of pedagogical and mathematical content knowledge. *Teaching and teacher education*, 12(4):429-442.

FRANK, M.L. 1990. What myths about mathematics are held and conveyed by teachers? *Arithmetic teacher*, 38(5):10-12, January.

FREEBODY, P. 2003. *Qualitative research in education: interaction and practice*. London: Sage. 234 p.

FREUDENTHAL, H. 1973. *Mathematics as an educational task*. Dordrecht: Reidel. 680 p.

FREUDENTHAL, H. 1978. *Weeding and sowing: preface to a science of mathematical education*. Dordrecht: Reidel. 315 p.

FREUDENTHAL, H. 1983. *Didactical phenomenology of mathematical structures*. Dordrecht: Reidel. 595 p.

FREUDENTHAL, H. 1987. Mathematics starting and staying in reality. (In Wirzup, I. & Streit, R., eds. *Developments in school mathematics around the world*. Proceedings of the UCSMP International Conference on Mathematics Education, 28-30 March 1985. Reston, Va: National Council of Teachers of Mathematics. p. 279- 295.)

FREUDENTHAL, H. 1991. *Revisiting mathematics education*. Dordrecht: Kluwer. 200 p. (China lectures.)

FRY, H., KETTERIDGE, S. & MARSHALL, S. 2003. Understanding student learning. (In Fry, H., Ketteridge, S. & Marshall, S., eds. A handbook for teaching and learning in higher education. New York: Routledge Falmer. p. 9-25.)

FURNER, J.M. & BERMAN, B.T. 2003. Math anxiety: overcoming a major obstacle to the improvement of student math performance. *Childhood education*, 79:170-174, Spring.

GAGATSI, A. & SHIAKALLI, M. 2004. Ability to translate from one representation of the concept of function to another and mathematical problem solving. *Educational psychology*, 24(5):645-657, October.

GALBRAITH, P. & HAINES, C. 1998. Disentangling the nexus: attitudes to mathematics and technology in a computer learning environment. *Educational studies in mathematics*, 36:275-29.

GALBRAITH, P. & HAINES, C. 2000. Conceptual mis(understandings) of beginning undergraduates. *International journal of mathematical education in science and technology*, 31(5):651-678.

GARNER, R. 1987. Metacognition and reading comprehension. Norwood, N.J.: Ablex. 165 p.

GAROFALO, J. 1989. Beliefs and their influence on mathematical performance. *Mathematics teacher*, 82(5):502-505, October.

GAROFALO, J., DRIER, H., HARPER, S., TIMMERMAN, M.A. & SHOCKEY, T. 2000. Promoting appropriate uses of technology in mathematics teacher preparation. *Contemporary Issues in Technology and Teacher Education* [Online serial], 1(1). <http://www.citejournal.org/vol1/iss1/currentissues/mathematics/article1.htm> Datum van gebruik: 24 Sept. 2008.

GOLDIN, G.A. 1997. Observing mathematical problem solving through task-based interviews. *Journal for research in mathematics education: Qualitative research methods in mathematics education*, 9: 40-177.

GOLDIN, G.A. 2000. A scientific perspective on structured, task-based interviews in mathematics education research. (In Kelly, A.E. & Lesh, R.A., eds. Handbook of research design in mathematics and science education. Mahwah, N.J: Erlbaum. p. 517-545.)

GOOS, M., GALBRAITH, P., RENSHAW, P. & GEIGER, V. 2003. Perspectives on technology mediated learning in secondary school mathematics classrooms. *Journal of mathematical behaviour*, 19. <http://espace.library.uq.edu.au/view.php?pid=UQ:10304>. Datum van gebruik: 6 Sept. 2007.

GOULDING, M., ROWLAND, T. & BARBER, P. 2002. Does it matter? Primary teacher trainees' subject knowledge in mathematics. *British educational research journal*, 28(5):689-704.

GOURGEY, A.F. 2001. Metacognition in basic skills instruction. (In Hartman, H., ed. Metacognition in learning and instruction: theory research and practice. Dordrecht: Kluwer. p. 17-32.)

GRAVEMEIJER, K.P.E. 1994. Developing realistic mathematics education. Utrecht: Utrecht University, Centre for Science and Mathematics Education, Freudenthal Institute, Research Group on Mathematics Education. 222 p.

GRAY, E.M. & TALL, D.O. 1991. Duality, ambiguity and flexibility in successful mathematical thinking. (In Proceedings of the 15th Conference of the International Group for the Psychology of Mathematics Education, Assisi, 2:72-79. 8 p.) <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot1991h-gray-procept-pme.pdf> Datum van gebruik: 13 Sept. 2007.

GRAY, E.M. & TALL, D.O. 1993. Success and failure in mathematics: the flexible meaning of symbols as process and concept. *Mathematics teaching*, 142:6-10, March.

GRAY, E.M. & TALL, D.O. 1994. Duality, ambiguity, and flexibility: a perceptual view of simple arithmetic. *Journal for research in mathematics education*, 25(2):116-140.

GREER, S. 2006. A study of the effect of calculator use on computation skills of high school mathematics students. <http://www.wfu.edu/education/gradtea/forum06/proceedings06.pdf#page=65> Datum van gebruik: 15 Okt. 2008.

GROOTENBOER, P.J. 2003. The affective views of primary school children. (In Pateman, N.A., Dougherty, B.J. & Zilliox, J., eds. Navigating between theory and practice. Proceedings of the 27th Conference of the International Group for the Psychology of Mathematics Education, v. 3. Honolulu, Hi.: University of Hawaii. p. 1-8.)

GROUWS, D.A. & CRAMER, K. 1989. Teaching practices and student affect in problem solving lessons of select junior-high mathematics teachers. (In McLeod, D.B. & Adams, V.M., eds. Affect and mathematical problem solving: a new perspective. New York: Springer. p. 149-161.)

HAAPASALO, L. 2003. The conflict between conceptual and procedural knowledge: should we need to understand in order to be able to do, or vice versa? <http://www.joensuu.fi/lenni/PC-Conflict.pdf> Datum van gebruik: 13 Maart 2006.

HAAPASALO, L. & KADIJEVICH, D. 2000. Two types of mathematical knowledge and their relation. *Journal für Mathematikdidaktik*, 21(2):139-157.

HABRE, S. & ABBOUD, M. 2006. Students' conceptual understanding of function and its derivative in an experimental calculus course. *Journal of mathematical behaviour*, 25:57-72.

HACKETT, G. & BETZ, N.E. 1989. An exploration of the mathematics self-efficacy / mathematics performance correspondence. *Journal for research in mathematics education*, 20(3):261-273.

HADFIELD, O.D. & McNEIL, K. 1994. The relationship between Myers-Briggs personality type and mathematics anxiety among preservice elementary teachers. *Journal of instructional psychology*, 21(4):375, December. (10p). Beschikbaar: Academic Search Premier. Datum van gebruik: 29 Sept. 2008.

HALE-HANIFF, M. & PASZTOR, A. 1999. Co-constructing subjective experience: a constructive approach. *Dialogues in psychology*, 16.0. <http://www.cs.fiu.edu/~pasztora/co-constr/coconstr2.html> Datum van gebruik: 18 Aug. 2007.

HANDAL, B. 2003. Philosophies and pedagogies of mathematics education. *Philosophies of mathematics education journal*, 17, May. <http://www.people.ex.ac.uk/PErnest/pome17/handal.htm> Datum van gebruik: 13 Aug. 2007.

HANNAFIN, M.J. & LAND, S.M. 1997. The foundations and assumptions of technology-enhanced student-centered learning environments. *Instructional science*, 25: 167-202.

HANNULA, M., HANNA, M., & PEHKONEN, E. 2004. Development of understanding and self-confidence in mathematics. (In Hoines, M.J. & Fuglestad, A.B., eds. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 3:17-24.)

HAREL, G., SELDEN, A. & SELDEN, S. 2006. Advanced mathematical thinking: some PME perspectives. (In Gutierrez, A. & Boero, P., eds. Handbook of research on the PME: past present and future. Rotterdam: Sense Publishers. p. 147-172.)

HARTMAN, H.J. 2001. Developing students' metacognitive knowledge and skills. (In Hartman, H., ed. Metacognition in learning and instruction: theory research and practice. Dordrecht: Kluwer. p. 33-68.)

HATTIE, J., BIGGS, J. & PURDIE, N. 1996. Effects of learning skills interventions on student-learning: a meta-analysis. *Review of educational research*, 66(2): 99-136, Summer.

HEMBREE, R. 1990. The nature, effects, and relief of mathematics anxiety. *Journal for research in mathematics education*, 21(1):33-46, January.

HENNINGSEN, M. & STEIN, M.K. 1997. Mathematical tasks and student cognition: classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for research in mathematics education*, 28(5):524-549.

HERMANN, M. 2004. Teaching and learning in realistic mathematics education. http://www.partnership.mmu.ac.uk/cme/Student_Writings/TS1/MarkHerman.html Datum van gebruik: 12 Sept. 2008.

HERSCOVICS, N. 1996. The construction of conceptual schemes in mathematics. (In Steffe, L.P. & Nesher, P., eds. Theories of mathematical learning. Mahwah, N.J.: Erlbaum. p. 351-379.)

HERSH, R. 1998. Some proposals for reviving the philosophy of mathematics. (In Tymoczko, T., ed. New directions in the philosophy of mathematics. Princeton, N.J.: Princeton University Press. p. 1-28.)

HIEBERT, J. & CARPENTER, T.P. 1992. Learning and teaching with understanding. (In Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 65-97.)

HIEBERT, J., CARPENTER, T.J., FENNEMA, E., FUSON, K.C., HUMAN, P., MURRAY, H., OLIVIER, A. & WEARNE, D. 1996. Problem solving as a basis for reform in curriculum and instruction: the case of mathematics. *Educational researcher*, 25(4):12-21, May.

HIEBERT, J., CARPENTER, T.J., FENNEMA, E., FUSON, K.C., WEARNE, D., MURRAY, H., OLIVIER, A. & HUMAN, P. 1997. Making sense: teaching and learning mathematics with understanding. Portsmouth, N.H.: Heinemann. 184 p.

HIEBERT, J. & GROUWS, D.A. 2007. The effects of classroom mathematics teaching on students' learning. (In Lester, F.K. (jr.), ed. The handbook of research on mathematics teaching and learning. 2nd ed. Joint Publication: Reston, VA: National Council of Teachers of Mathematics; Charlotte, NC: Information Age Publishing. p. 371-404.)

HIEBERT, J. & LEFEVRE, P. 1986. Conceptual and procedural knowledge in mathematics: an introductory analysis. (In Hiebert, J., ed. Conceptual and procedural knowledge: the case of mathematics. Hillsdale, N.J.: Erlbaum. p. 1-27.)

HILL, H.C., ROWAN, B. & BALL, D.L. 2005. Effects of teachers' mathematical knowledge for teaching on student achievement. *American educational research journal*, 42(2):371-406, Summer.

HILL, H.C., SCHILLING, S.G. & BALL, D.L. 2004. Developing measures of teachers' mathematics knowledge for teaching. *Elementary school journal*, 105(1):11-30.

HITT, F. 1998. Difficulties in the articulation of different representations linked to the concept of function. *Journal of mathematical behaviour*, 17(1):123-134.

HOFER, K. & PINTRICH, P.R. 1997. The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning. *Review of educational research*, 67(1):88-140, Spring.

HOLLAR, J.C. & NORWOOD, K. 1999. The effects of a graphing-approach intermediate algebra curriculum on students' understanding of function. *Journal for research in mathematics education*, 30(2):220-226, March.

HOWE, K.R. 1988. Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational researcher*, 17(8):10-16, November.

HOWIE, S.J. 1999. Third International Mathematics and Science Study repeat (TIMMS-R): Executive summary. Pretoria: Human Sciences Research Council. 29 p.

HOWIE, S. 2001. Mathematics and science performance in Grade 8 in South Africa 1998/1999. Pretoria: HSRC. 170 p.

HOWIE, S.J., MARSH, T.A., ALLUMMOOTTIL, J., GLENCROSS, M., DELIWE, C. & HUGHES, C.A. 2000. Middle school students' performance in mathematics in the Third International Mathematics and Science Study: South African realities. *Studies in educational evaluation*, 26:61-77.

HOYT, J.E. & SORENSEN, C.T. 2001. High school preparation, placement testing, and college remediation. *Journal of developmental education*, 25(2), Winter.

HUYSAMEN, G.K. 1998. Die voorspelling van akademiese prestasie ná die eerste universiteitsjaar. *Journal of industrial psychology*, 24(1): 41-46.

IOSSI, L. 2007. Strategies for reducing math anxiety in post-secondary students. (In Nielsen, S.M. & Plakhotnik, M.S., eds. Proceedings of the sixth Annual College of Education Research Conference: Urban and International Education Section. Miami: Florida International University. p. 30-35.) http://coeweb.fiu.edu/research_conference/ Datum van gebruik: 10 Junie 2008.

IVANKOVA, N.V., CRESWELL, J.W. & PLANO CLARK, V.L. 2007. Foundations and approaches to mixed methods research. (In Maree, K., ed. First steps in research. Pretoria: Van Schaik. p. 253-282.)

JACKIW, N. 1995. The geometer's sketchpad. Berkeley, Calif.: Key Curriculum Press Software.

JANVIER, C. 1987. Translation processes in mathematics education. (*In Janvier, C., ed. Problems of representation in the teaching and learning of mathematics. Hillsdale, N.J.: Erlbaum. p. 27-32.*)

JAWORSKI, B. 2001. Developing mathematics teaching. (*In Lin, F.L. & Cooney, T.J., eds. Making sense of mathematics teacher education. Dordrecht: Kluwer. p. 295-320.*)

JEGEDE, O., TAPLIN, M. & CHAN, S. 2000. Trainee teachers' perception of their knowledge about expert teaching. *Educational research*, 42(3):287-308, Winter.

JICK, T.D. 1979. Mixing qualitative and quantitative methods: triangulation in action. *Administrative science quarterly*, 24: 603-611, December.

JOHNSON, B. & CHRISTENSEN, L. 2004. Educational research: qualitative, quantitative and mixed methods approaches. 2nd ed. Boston, Mass.: Pearson. 564 p.

JOHNSON, R.B. & ONWUEGBUZIE, A.J. 2004. Mixed methods research: a research paradigm whose time has come. *Educational researcher*, 33(7):14-26, October.

JONES, T. 2000. Instructional approaches to teaching problem solving in mathematics: integrating theories of learning and technology.
<http://www.mindymac.com/educ6100projects/TjonesProblem6100.htm> Datum van gebruik: 31 Aug. 2007.

JOURDAN, N., CRETCHLEY, P. & PASSMORE, T. 2007. Secondary-tertiary transition: what mathematics skills can and should we expect this decade? (Proceedings of the 30th Annual Conference of the Mathematics Education Research Group of Australasia.)

KAMINSKI, E. 2003. Promoting pre-service teacher education students' reflective practice in mathematics. *Asia-Pacific journal of teacher education*, 31(1):21-32.

KAPUT, J. 1989. Linking representations in the symbol systems of algebra. (*In Wagner, S. & Kieran, C., eds. Research issues in the learning and teaching of algebra. Reston, Va.: National Council of Teachers of Mathematics. p. 167-194.*)

KAPUT, J. 1992. Technology and mathematics education. (*In Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 515-556.*)

KARP, K.S. 1991. Elementary school teachers' attitudes toward mathematics: the impact on students' autonomous learning skills. *School science and mathematics*, 91(6):265-270, October.

KELLER, B.A. & HIRSCH, C.R. 1998. Student preferences for representations of functions. *International journal of mathematical education in science and technology*, 29(1): 1-17.

KENNEDY, M.M. 1998. Education reform and subject matter knowledge. *Journal of research in science teaching*, 35(3):249-263.

KERSAINT, G. 2007. Toward technology integration in mathematics education: a technology-integration course planning assignment. *Contemporary issues in technology and teacher education*, 7(4):256-278.

KERSH, M.E. & MCDONALD, J. 1991. How do I solve thee? Let me count the ways. *Arithmetic teacher*, 39(2):38-41, October.

KIERAN, C. 1992. The learning and teaching of school algebra. (In Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 390-419.)

KILPATRICK, J., SWAFFORD, J. & FINDELL, B. 2001. Adding it up: helping children learn mathematics. Washington, D.C.: National Academy Press. 454 p.

KLOOSTERMAN, P. 1988. Self-confidence and motivation in mathematics. *Journal of educational psychology*, 80(3):345-351.

KLOOSTERMAN, P. 2002. Beliefs about mathematics and mathematics learning in the secondary school: measurement and implications for motivation. (In Leder, G.C., Pehkonen, E. & Törner, G., eds. Beliefs: a hidden variable in mathematics education. Dordrecht: Kluwer. p. 247-269.)

KLOOSTERMAN, P., RAYMOND, A.M. & EMENAKER, C. 1996. Students' beliefs about mathematics: a three- year study. *Elementary school journal*, 97(1):39-56, September.

KNUTH, E.J. 2000. Understanding connections between equations and graphs. *Mathematics teacher*, 93(1):48-53, January.

KNUTH, E.J. & HARTMAN, C.E. 2005. Using technology to foster students' mathematical understandings and intuitions. (In Masalski, W.J. & Elliot, P.C., eds. Technology-supported mathematical learning environments. NCTM Yearbook. Reston, Va. p. 151-164.)

KOGELMAN, S. & WARREN, J. 1978. Mind over math. New York: Dial Press. 239 p.

KORTHAGEN, F.A.J. & KESSELS, J.P.A.M. 1999. Linking theory and practice: changing the pedagogy of education. *Educational researcher*, 28(4):4-17, May.

KUH, G.D., PACE, R. & VESPER, N. 1997. The development of process indicators to estimate student gains associated with good practices in undergraduate education. *Research in higher education*, 38(4):435-454.

LAMB, J. & BOOKER, G. 2004. The impact of developing teacher conceptual knowledge on students' knowledge of division. (In Hoines, M.J. & Fuglestad, A.B., eds. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 3:177-184.)

LEEDY, P.D. & ORMROD, J.E. 2005. Practical research: planning and design. Upper Saddle River, N.J.: Prentice Hall. 318 p.

LE MOYNE COLLEGE, 1999. Math anxiety. http://www.lemoyne.edu/academic_advisement/academic_support_center/mathanx.htm Datum van gebruik: 26 Junie 2008.

LEONARD, W.J., GERACE, W.J. & DUFRESNE, R.J. 1999. Concept-based problem solving: making concepts the language of physics. <http://umperg.physics.umass.edu> Datum van gebruik: 12 Feb. 2007.

LESH, R. & DOERR, H.M. 2003. In what ways does a models and modeling perspective move beyond constructivism? (In Lesh, R. & Doerr, H.M., eds. Beyond constructivism: models and modeling perspectives on mathematics problem solving, learning and teaching. Mahwah, N.J.: Erlbaum. p. 519-556.)

LESH, R. & LEHRER, R. 2003. Models and modelling perspectives on the development of students and teachers. *Mathematical thinking and learning*, 5(2&3):109-129.

LESH, R. & ZAWOJEWSKI, J. S. 2007. Problem solving and modeling. (In Lester, F.K. (jr.), ed. The handbook of research on mathematics teaching and learning. 2nd ed. Joint Publication: Reston, VA: National Council of Teachers of Mathematics; Charlotte, NC: Information Age Publishing. p. 763-804.)

LESTER, F.K. (jr). & KEHLE, P.E. 2003. From problem solving to modelling: the evolution of thinking about research on complex mathematical activity. (In Lesh, R. & Doerr, H.M., eds. Beyond constructivism: models and modeling perspectives on mathematics problem solving, learning and teaching. Mahwah, N.J.: Erlbaum. p. 501-517.)

LESTER, F.K., GAROFALO, J. & KROLL, D.L. 1989. Self-confidence, interest, beliefs and metacognition: key influences on problem solving behaviour. (In McLeod, D.B. & Adams, V., eds. Affect and mathematical problem solving: a new perspective. New York: Springer. p. 75-88.)

LILJEDAHN, P.G. 2005. Mathematical discovery and affect: the effect of AHA! experiences on undergraduate mathematics students. *International journal of mathematical education in science and technology*, 36(2-3):219-235.

LINCOLN, Y.S. & GUBA, E.G. 1985. Naturalistic inquiry. London: Sage. 416 p.

LIVINGSTON, C. & BORKO, H. 1990. High school mathematics review lessons. *Journal for research in mathematics education*, 21(5):372-387, November.

LLOYD, G.W. & WILSON, M. 1998. Supporting innovation: the impact of a teacher's conceptions of functions on his implementation of a reform curriculum. *Journal for research in mathematics education*, 29(3):248-274, July.

LONG, C. 2003. Mathematics knowledge for teaching: how do we recognise this? (In Jaffer, S. & Burgess, L., eds. Proceedings of the Ninth Annual Congress of the Association for Mathematics Education of South Africa (AMESA). Cape Town. p. 194-204.)

LORTIE, D. 1975. Schoolteacher. Chicago, Ill.: University of Chicago Press. 284 p.

LOUW, C.J. 2003. From desperation with mathematics results to liberation through action research. http://www.education.up.ac.za/alarpm/PRP_pdf/Louw.PDF Datum van gebruik: 28 Julie 2008.

LUCANGELI, D. & CORNOLDI, C. 1997. Mathematics and metacognition: what is the nature of the relationship? *Mathematical cognition*, 3(2):121-139.

LYNCH, B.K. 2005. The paradigm debate. <http://www.iltaonline.com/newsletter/01-2005may/latdialog-lynch.htm>. Datum van gebruik: 26 Sept. 2007.

MA, L. 1999. Knowing and teaching elementary mathematics. Teachers' understanding of fundamental mathematics in China and the United States. Mahwah, N.J.: Erlbaum. 166 p.

MA, X. 1999. A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for research in mathematics education*, 30(5):520-540.

MA, X. & KISHOR, N. 1997. Assessing the relationship between attitude toward mathematics and achievement in mathematics: a meta-analysis. *Journal for research in mathematics education*, 28(1):26-47.

MACNAB, D.S. & PAYNE, F. 2003. Beliefs, attitudes and practices in mathematics teaching: perceptions of Scottish primary school student teachers. *Journal of education for teaching*, 29(1):55-68.

MALAN, S.B. 2008. The development of an integrated problem-based learning (PBL) approach in a post-matric programme at the University of Stellenbosch. Stellenbosch: US. (Thesis – D.Phil.) <http://hdl.handle.net/10019/870> Datum van gebruik: 20 Aug. 2008.

MALINSKY, M., ROSS, A., PANNELLS, T. & McJUNKIN, M. 2006. Math anxiety in pre-service elementary school teachers. *Education*, 127(2):274-280.

MANOUCHEHRI, A. 1997. School mathematics reform: implications for mathematics teacher preparation. *Journal of teacher education*, 48(3):197-209, May-June.

MANOUCHEHRI, A. & GOODMAN, T. 1998. Mathematics curriculum reform and teachers: understanding the connections. *Journal of educational research*, 92(1):27-41, Sept.-Oct.

MAPOLELO, D.C. 1999. Do pre-service primary teachers who excel in mathematics become good mathematics teachers? *Teaching and teacher education*, 15(6):715-725, August.

MAREE, J.G. 1995. Kommentaar op die nuwe benadering tot die onderrig en leer van wiskunde in die RSA: Hoe geregverdig is kritiek? *Suid-Afrikaanse tydskrif vir opvoedkunde*, 15(2):66-71.

MAREE, J.G. 1996. Die studie-oriëntasie vraelys in wiskunde (SOW). Pretoria: RGN.

MAREE, J.G. 1999. Difference in orientation towards studying mathematics of South African high school students: developing a study orientation questionnaire in mathematics. *Psychological reports*, 84:467-476.

MAREE, K., ALDOUS, C., HATTINGH, A., SWANEPOEL, A. & VAN DER LINDE, M. 2006. Predictors of learner performance in mathematics and science according to a large-scale study in Mpumalanga. *South African journal of education*, 26(2):229-252.

MAREE, J.G. & CRAFFORD, G. 2005. 'n Ondersoek na fasette van leerders in 'n privaatskool se studieoriëntasie en die verband daarvan met wiskunde-prestasie. *Suid-Afrikaanse tydskrif vir natuurwetenskap en tegnologie*, 24(3):84-92.

MAREE, J.G. & DE BOER, A. 2003. Assessment of thinking style preferences and language proficiency for South African students whose native languages differ. *Psychological reports*, 93:449-457.

MAREE, J.G. & GRIMBEEK, J. 2002. Toelating van graad 12-leerders met voorwaardelike of geen matrikulasie-endossement tot die Fakulteit Opvoedkunde: Universiteit van Pretoria. *Suid Afrikaanse tydskrif vir natuurwetenskap en tegnologie*, 21(3):83-89.

MAREE, J.G., PRETORIUS, A. & EISELEN, R.J. 2003. Predicting success among first year engineering students at the Rand Afrikaans University. *Psychological reports*, 93:399-409.

MAREE, J.G., PRINSLOO, W.B.J. & CLAASSEN, N.C.W. 1997. Handleiding vir die studie-oriëntasievraelys in wiskunde (SOW). Pretoria: RGN. 36 p.

MAREE, J.G. & SCHOEMAN, W.J. 1997. Ontwikkeling van 'n studie-oriëntasievraelys in wiskunde. *Suid-Afrikaanse tydskrif vir natuurwetenskap en tegnologie*, 16(3):127-134.

MAREE, K. & PIETERSEN, J. 2007. The quantitative research process. (In Maree, K., ed. First steps in research. Pretoria: Van Schaik. p. 145-153.)

MARTINEZ, J.G.R. & MARTINEZ, N.C. 1996. Math without fear: a guide for preventing math anxiety in children. Boston, Mass.: Allyn & Bacon. 167 p.

MATTHEE, M. & ROODE, D. 1998. The development of computer supported co-operative mathematics learning at South African community learning centres. (Proceedings of the Sixth European Conference on Information Systems 1688-1695. Aix-en-Provence: Euro-Arab Management School.)

MATTHEWS, M.E. & SEAMAN, W.I. 2007. The effects of different undergraduate mathematics courses on the content knowledge and attitude towards mathematics of preservice elementary teachers. www.k-12prep.math.ttu.edu/journal/contentknowledge/matthews01/article.pdf Datum van gebruik: 10 Sept. 2008.

MAXCY, S.J. 2003. Pragmatic threads in mixed methods research in the social sciences: the search for multiple modes of inquiry and the end of the philosophy of formalism. (In Tashakkori, A. & Teddlie, C., eds. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif.: Sage. p. 51-89.)

MAYER, R.E. 1994. Study habits and strategies. (In Husén, T. & Postlethwaite, T.N., eds. The international encyclopaedia of education, 10:5829-5831. London: Pergamon.)

MAYER, R.E. 1996. Learners as information processors: legacies and limitations of educational psychology's second metaphor. *Educational psychologist*, 31(3/4):151-161.

MAYER, R.E. 2002a. Rote versus meaningful learning. *Theory into practice*, 41(4):226-232, Autumn.

MAYER, R.E. 2002b. The promise of educational psychology, v. 2: Teaching for meaningful learning. Upper Saddle River, N.J.: Merrill Prentice Hall. 277 p.

MAYER, R.E. 2003. Learning and instruction. Upper Saddle River, N.J.: Merrill Prentice Hall. 516 p.

McGRATH, M.M. & BRAUNSTEIN, A. 1997. The prediction of freshmen attrition: an examination of the importance of certain demographic, academic, financial, and social

factors. *College student journal*, 31(3): 396. (12p). September. Beskikbaar: Academic Search Premier. Datum van gebruik: 5 Julie 2008.

McLEOD, D.B. 1989. Beliefs, attitudes and emotions: new views of affect in mathematics education. (In McLeod, D.B. & Adams, V.M., eds. *Affect and mathematical problem solving: a new perspective*. New York: Springer. p. 245-258.)

McLEOD, D.B. 1992. Research on affect in education: a reconceptualization. (In Grouws, D.A., ed. *Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics*. New York: Macmillan/NCTM. p. 575-596.)

MEREDITH, A. 1993. Knowledge for teaching mathematics: some student teachers' views. *Journal of education for teaching*, 19(3):325. (14p). Beskikbaar: Academic Search Premier. Datum van gebruik: 22 Mei 2006.

MEREDITH, A. 1995. Terry's learning: some limitations of Shulman's pedagogical content knowledge. *Cambridge journal of education*, 25(2), June. (11p). Beskikbaar: Academic search premier. Datum van gebruik: 9 Julie 2007.

MERRIAM, S.B. 1998. *Qualitative research and case study applications in education*. San Francisco, Calif.: Jossey-Bass. 275 p.

MILLER, L.D. & MITCHELL, C.E. 1994. Mathematics anxiety and alternative methods of evaluation. *Journal of instructional psychology*, 21(4):353. (6p). Beskikbaar: Academic Search Premier. Datum van gebruik: 28 Sept. 2008.

MJI, A. 2003. A three-year perspective on conceptions of and orientations to learning mathematics of prospective teachers and first-year university students. *International journal of mathematical education in science and technology*, 34(5):687-698.

MJI, A. & MAKGATO, M. 2006. Factors associated with high school learners' poor performance: a spotlight on mathematics and physical science. *South African journal of education*, 26(2):253-266.

MOHAMED, M. & TEN NAI, T. 2005. The use of metacognitive process in learning mathematics. (The Mathematics Education into the 21st Century project.) (Universiti

Teknologi Malaysiaa. Reform, revolution and paradigm shifts in mathematics education. Johor Bahru, Malaysia, Nov.23 - Dec. 1.)

MOLOI, M.Q. 2006. Mathematics achievement in South Africa: a comparison of the official curriculum with pupil performance in the SACMEQ II Project. http://www.jet.org.za/item.php?i_id=211&PHPSESSID=8d583502dfd8d27b92d2a9f92919ff44 Datum van gebruik: 12 Julie 2007.

MONK, S. 1992. Students' understanding of a function given by a physical model. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 175-194.)

MONTAGUE, M. 1992. The effects of cognitive and metacognitive strategy instruction on the mathematical problem solving of middle school students with learning disabilities. *Journal of learning disabilities*, 25(4):230-248, April.

MONTEITH, J.L. de K. 1994. Metakognisie, leerstrategieë en motivering vir doeltreffende leer. *Suid-Afrikaanse tydskrif vir hoër onderwys*, 8(3):90-93.

MOODALEY, R.R., GROBLER, A.A. & LENS, W. 2006. Study orientation and causal attribution in mathematics achievement. *South African journal of psychology*, 36(3):34-655.

MORENO-ARMELLA, L. & TRIGO, M.S. 2001. The students' processes of transforming the use of technology in mathematics problem solving tools. (In Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 2:57-64.)

MORSE, J.M. 2003. Principles of mixed methods and multimethod research design. (In Tashakkori, A. & Teddlie, C., eds. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif: Sage. p. 189-208.)

MORSE, J.M., BARRETT, M., MAYAN, M., OLSON, K. & SPIERS, J. 2002. Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods*, 1(2). Article 2. <http://www.ualberta.ca/~ijqm/> Datum van gebruik: 13 Okt. 2007.

MOSCHKOVICH, J., SCHOENFELD, A.H. & ARCAVI, A. 1993. Aspects of understanding: on multiple perspectives and representations of linear relations and connections among them. (In Romberg, T.A., Fennema, E. & Carpenter, T.P., eds. Integrating research on the graphical representation of functions. Hillsdale, N.J.: Erlbaum. p. 69-100.)

MOUSOULIDES, N. & GAGATSIS, A. 2004. Algebraic and geometric approach in function problem solving. (In Hoines, M.J. & Fuglestad, A.B., eds. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 3:385-392.)

MOUSOULIDES, N. & PHILIPPOU, G. 2005. Students' motivational beliefs, self-regulation strategies and mathematics achievement. (In Chick, H.L. & Vincent, J.L., eds. Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education, v. 3. Melbourne: Psychology of Mathematics Education (PME). p. 321-328.)

MOUTON, J. 2001. How to succeed in your master's and doctoral studies: a South African guide and resource book. Pretoria: Van Schaik. 280p.

NAIDOO, B. 2007. Below par maths and science teaching x learning = economic strain. *Engineering news*, 16 Nov. http://www.engineeringnews.co.za/article.php?a_id=120739 Datum van gebruik: 15 Jan. 2008.

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM). 1989. Curriculum and evaluation standards for school mathematics. Reston, Va.: NCTM. 258 p.

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM). 1991. Professional standards for reaching mathematics. Reston, Va.: NCTM. 196 p.

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS (NCTM). 2000. Principles and standards for school mathematics. Reston, Va.: NCTM. 402 p.

NATIONAL RESEARCH COUNCIL (NRC). 1989. Everybody counts: a report to the nation on the future of mathematics and education. Washington, D.C.: National Academic Press.

NATIONAL RESEARCH COUNCIL (NRC). 1996. National science education standards. Washington, D.C.: National Academy Press.

NAUDE, A., ENGBRECHT, J., HARDING, A. & ROGAN, J. 2005. The influence of second language teaching on undergraduate mathematics performance. <http://science.up.ac.za/muti/language.pdf> Datum van gebruik: 3 Aug. 2008.

NEALE, D.C. 1969. The role of attitude in learning mathematics. *Arithmetic teacher*, 16: 631-640, December.

NESHER, P. 1986. Are mathematical understanding and algorithmic performance related? *For the learning of mathematics*, 6:2-9, November.

NEWS24.COM. 2004. Math pass rate no better. http://www.news24.com/News24/South_Africa/news/0,2-7-1442_1615954,00.html Datum van gebruik: 27 Nov. 2004.

NICKSON, M. 1992. The culture of the mathematics classroom: an unknown quantity? (*In* Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 101-114.)

NICOLAIDOU, M. & PHILIPPOU, G. 2003. Attitudes towards mathematics, self-efficacy and achievement in problem-solving. (*In* Proceedings of the Third Conference of the European Society for Research in Mathematics Education.) www.dm.unipi.it/~didattica/CERME3/proceedings Datum van gebruik: 23 Aug. 2007.

NIETFELD, J.L., CAO, L. & OSBORNE, J.W. 2005. Metacognitive monitoring accuracy and student performance in the postsecondary classroom. *The journal of experimental education*, 74(1):7-28.

NIEUWENHUIS, J. 2007a. Introducing qualitative research. (*In* Maree, K., ed. First steps in research. Pretoria: Van Schaik. p. 46-97.)

NIEUWENHUIS, J. 2007b. Analysing qualitative data. (*In* Maree, K., ed. First steps in research. Pretoria: Van Schaik. p. 98-122.)

NIEUWOUDT, H.D. 1998. Beskouings oor onderrig: implikasies vir die didaktiese skoling van wiskundeonderwysers. Potchefstroom: PU vir CHO. (Thesis - Ph.D). 396 p.

NIEUWOUDT, H.D. & GOLIGHTLY, A. 2006. Constructivism and teacher education: an integrated South African perspective. (In De Muynck, B. & Van der Walt, H., eds. The call to know the world. Amsterdam: Buijten & Schipperheijn. p. 107-131.)

NIEUWOUDT, H.D. & VAN DER SANDT, S. 2003. How well are mathematics teachers conceptually prepared to teach for learning? A case study of grade 7 geometry. (In Jaffer, S. & Burgess, L., eds. Proceedings of the Ninth Annual Congress of the Association for Mathematics Education of South Africa (AMESA). Cape Town. p. 224-235.)

O'CALLAGHAN, B.R. 1998. Computer-intensive algebra for students' conceptual knowledge of functions. *Journal for research in mathematics education*, 29(1):21-40.

O'LEARY, Z. 2004. The essential guide to doing research. London: Sage. 226 p.

OLIVIER, A. 1999. On constructivism. <http://academic.sun.ac.za/mathed/174/Constructivism.pdf>
Datum van gebruik: 26 Julie 2007.

OPT EYNDE, P., DE CORTE, E. & VERSCHAFFEL, L. 2002. Framing students' mathematical-related beliefs. (In Leder, G.C., Pehkonen, E. & Törner, G., eds. Beliefs: a hidden variable in mathematics education. Dordrecht: Kluwer. p. 13-37.)

PAJARES, M.F. 1992. Teachers beliefs and educational research: cleaning up a messy construct. *Review of educational research*, 62(3):307-332, Fall.

PAJARES, F. & MILLER, M.D. 1994. Role of self-efficacy and self-concept beliefs in mathematical problem solving: a path analysis. *Journal of educational psychology*, 86(2):195-203.

PAPE, S.J. & SMITH, C. 2002. Self-regulating mathematics skills. *Theory into practice*, 41(2), March. (10 p.). Beskikbaar: Academic Search Premier. Datum van gebruik: 23 Sept. 2005.

PARAS, J. 2001. Crisis in mathematics education. Student failure: challenges and possibilities. *South African journal of higher education*, 15(3):66-73.

PARIS, S.G. & CUNNINGHAM, A.E. 1996. Children becoming students. (In Berliner, D.C. & Calfee, R.C., eds. Handbook of educational psychology. p. 117-147.)

PARIS, S.G. & WINOGRAD, P. 1990. How metacognition can promote academic learning and instruction. (In Jones, B.F. & Idol, L., eds. Dimensions of thinking and cognitive instruction. Hillsdale, N.J.: Erlbaum. p. 15-51.)

PARNELL, S. & STATHAM, M. 2007. An effective preparation for tertiary mathematics. *International journal of mathematical education in science and technology*, 38(7):869-879, October.

PASZTOR, A. 2004. Radical constructivism has been viable: on math education and more. <http://www.kjf.ca/73-C41PA.htm> Datum van gebruik: 16 Aug. 2007.

PATTON, M.Q. 1990. Qualitative evaluation and research methods. 2nd ed. London: Sage. 532 p.

PEHKONEN, E. & PIETILÄ, A. 2003. On relationships between beliefs and knowledge in mathematics education. (In Proceedings of the Third Conference of the European Society for Research in Mathematics Education.) http://www.dm.unipi.it/~didattica/CERME3/proceedings/Groups/TG2/TG2_pehkonen_cerme3.pdf Datum van gebruik: 20 Aug. 2007.

PEIRCE, W. 2003. Metacognition: study strategies, monitoring, and motivation. <http://cademic.pgcc.edu/~peirce/MCCCTR/metacognition.htm> Datum van gebruik: 18 April 2006.

PENSO, S. 2002. Pedagogical content knowledge: how do student teachers identify and describe the causes of their pupils' learning difficulties? *Asia-Pacific journal of teacher education*, 30(1):25-37.

PERESSINI, D., BORKO, H., ROMAGNANO, L., KNUTH, E. & WILLIS, C. 2004. A conceptual framework for learning to teach secondary mathematics: a situative perspective. *Educational studies in mathematics*, 56:67-96.

PERRY, A.B. 2004. Decreasing math anxiety in college students. *College student journal*, 38(2), Jun. (4p). Beschikbaar: Academic Search Premier. Datum van gebruik: 5 Mei 2008.

PETERSON, P.L., FENNEMA, E. & CARPENTER, T.P. 1991. Teachers' knowledge of students' mathematics problem-solving knowledge. (In Brophy, J., ed. Advances in

research on teaching: teachers' knowledge of subject matter as it relates to their teaching practice, v. 2. Greenwich, Conn.: JAI Press. p. 49-86.)

PHILIPPOU, G.N. & CHRISTOU, C. 1998. The effects of a preparatory mathematics program in changing prospective teachers' attitudes towards mathematics. *Educational studies in mathematics*, 35(2):189-206, February.

PIERCE, R.U. & STACEY, K.C. 2002. Algebraic insight: the algebra needed to use computer algebra systems. *Mathematics teacher*, 95(8):622-627, November.

PIERCE, R., STACEY, K. & BARKATSAS, A. 2007. A scale for monitoring students' attitudes to learning mathematics with technology. *Computers & education*, 48(2):285-300, February.

PIETERSEN, J. & MAREE, K. 2007. Standardisation of a questionnaire. (In Maree, K., ed. First steps in research. Pretoria: Van Schaik. p. 214-223.)

PIETSCH, J., WALKER, R & CHAPMAN, E. 2003. The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of educational psychology*, 95(3):589-603, September.

PINTRICH, P.R. 1999. The role of motivation in promoting and sustaining self-regulated learning. *International journal of educational research*, 31:459-470.

PINTRICH, P.R. 2000. An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemporary educational psychology*, 25:92-104.

PINTRICH, P.R. 2002. The role of metacognitive knowledge in learning, teaching and assessing. *Theory into practice*, 41(4):219-225, Autumn.

PLOTZ, M. 2007. Criteria for effective mathematics teacher education with regard to mathematical content knowledge for teaching. Potchefstroom: NWU. (Thesis - Ph.D). 275 p.

POGGENPOEL, M. & MYBURGH, C. 2003. The researcher as research instrument in educational research: a possible threat to trustworthiness? (A research instrument.) *Education*, 124(2):320; 418-421.

POLYA, G. 1957. How to solve it. London: Penguin. 253 p.

PONTE, J.P., MATOS, J.F., LEAL, H.M.G.L. & CANAVARRO, A.P. 1992. Students' views and attitudes towards mathematics teaching and learning: a case study of a curriculum experience. (In Proceedings of the 16th Conference of the International Group of the Psychology of Mathematics Education.) [http://www.educ.fc.ul.pt/docentes/jponte/docs-uk/92%20Ponte%20etc%20\(PME\).doc](http://www.educ.fc.ul.pt/docentes/jponte/docs-uk/92%20Ponte%20etc%20(PME).doc) Datum van gebruik: 25 Julie 2007.

PRAWAT, R.S. 1992. Teachers' beliefs about teaching and learning: a constructivist perspective. *American journal of education*, 100(3):354-395, May.

QUILTER, D. & HARPER, E. 1988. "Why we didn't like mathematics and why we can't do it." *Educational research*, 30(2):121-128, June.

QUINN, R.J. 1997. Effects of mathematics methods courses on the mathematical attitudes and content knowledge of preservice teachers. *Journal of educational research*, 91(2):108-113, November/December.

QUINN, R.J. 1998. The influence of mathematics methods courses on preservice teachers' pedagogical beliefs concerning manipulatives. *Clearing House*, 71(4):236-238, Mar-April. Beschikbaar: ERIC. Datum van gebruik: 16 Maart 2006.

RALLIS, S.F. & ROSSMAN, G.B. 2003. Mixed methods in evaluation contexts: a pragmatic framework. (In Tashakkori, A. & Teddlie, C., eds. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif.: Sage. p. 491-512.)

RAYMOND, A.M. 1997. Inconsistency between a beginning elementary school teacher's mathematical beliefs and teaching practice. *Journal for research in mathematics education*, 28(5):550-576, November.

REINKE, K.S. 1997. Area and perimeter: preservice teachers' confusion. *School science and mathematics*, 97(2), Feb. (3 p.) Beschikbaar: Academic Search Elite. Datum van gebruik: 29 Junie 2007.

REYNOLDS, A.J. & WALBERG, H.J. 1992. A structural model of high school mathematics. *Journal of educational research*, 85(3):150-158, January-February.

ROMBERG, T.A. & CARPENTER, T.P. 1986. Research on teaching and learning mathematics: two disciplines of scientific inquiry. (In Wittrock, M. C., ed. Handbook of research on teaching. 3rd ed. New York: Macmillan. p. 850-873.)

ROMBERG, T.A. & KAPUT, J.J. 1999. Mathematics worth teaching, mathematics worth understanding. (In Fennema, E. & Romberg, T.A., eds. Mathematics classrooms that promote understanding. Mahwah, N.J.: Erlbaum. p. 3-17.)

RUFFEL, M., MASON, J. & ALLEN, B. 1998. Studying attitude to mathematics. *Educational studies in mathematics*, 35:1-18.

SAJKA, M. 2003. A student's understanding of the concept of function. *Educational studies in mathematics*, 53(3):29-254, September.

SANFORD, B.J. 1998. First year experience: easing the transition to college. <http://www.umkc.edu/cad/nade/nededocs/98conpap/bscpap98.htm> Datum van gebruik: 15 Jan. 2008.

SAJKA, M. 2005. What subject matter knowledge about the concept of function should the teacher have? (In Proceedings of the 57th CIEAEM Conference, Piazza Armerina, 23-29 July.) http://math.unipa.it/~grim/cieaem57_sajka_poster.pdf Datum van gebruik: 20 Okt. 2008.

SANTOS, J.R.A. 1999. Cronbach's alpha: a tool for assessing the reliability of scales. *Journal of extension*, 37(2), April. <http://www.joe.org/joe/1999april/tt3.html> Datum van gebruik: 15 Okt. 2007.

SAS INSTITUTE Inc. 2007. The SAS System for Windows release 9.1TS Level 1M3. Copyright© by SAS Institute Inc., Cary, NC, USA.

SCALISE, A., BESTERFIELD-SACRE, M., SHUMAN, L. & WOLFE, H. 2000. First term probation: models for identifying high risk students. (In Proceedings of the 30th ASEE/IEEE Frontiers in education conference, Kansas City, MO, 18-21 October. p.11-16.) <http://fie.engrng.pitt.edu/fie2000/papers/1276.pdf> Datum van gebruik: 3 Junie 2008.

SCHOENFELD, A.H. 1985. Mathematical problem solving. London: Academic Press. 409 p.

SCHOENFELD, A.H. 1988. Problem solving. (In Campbell, P.J. & Grinstein, L.S., eds. Mathematics education in secondary schools and two-year colleges. New York: Garland. p. 81-88.)

SCHOENFELD, A.H. 1989. Explorations of students' mathematical beliefs and behaviour. *Journal for research in mathematics education*, 20(4):338-355.

SCHOENFELD, A.H. 1992. Learning to think mathematically: problem solving, metacognition and sense making in mathematics. (In Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 575-596.)

SCHOENFELD, A.H. 1994. Mathematical thinking and problem solving. Hillsdale, N.J.: Erlbaum. 339 p.

SCHRAM, P., WILCOX, S., LANIER, P. & LAPPAN, G. 1988. Changing mathematical conceptions of preservice teachers: a content and pedagogical intervention. East Lansing: Michigan State University, National centre for research on teacher education. (Research report 88-4.) http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1e/48/91.pdf Datum van gebruik: 23 Aug 2007.

SCHRAW, G. 2001. Promoting general metacognitive awareness. (In Hartman, H., ed. Metacognition in learning and instruction: theory research and practice. Dordrecht: Kluwer. p. 3-16.)

SCHRAW, G. & DENNISON, R.S. 1994. Assessing metacognitive awareness. *Contemporary educational psychology*, 19:460-475.

SCHRAW, G. & MOSHMAN, D. 1995. Metacognitive theories. *Educational psychology review*, 7(4):351-371.

SCHUCK, S. 1996. Chains in primary teacher mathematics education courses: an analysis of powerful constraints. *Mathematics education research journal*, 8(2):119-136.

SCHUNK, D.H. 1991. Self-efficacy and academic motivation. *Educational psychologist*, 26(3 & 4):207-231.

SCHUNK, D.H. 2000. Learning theories: an educational perspective. 3rd ed. Upper Saddle River, N.J.: Prentice Hall. 522 p.

SCHWARZ, B. & DREYFUS, T. 1995. New actions upon old objects: a new ontological perspective on functions. *Educational studies in mathematics*, 29:259-291.

SCHWEINLE, A., MEYER, D.K. & TURNER, J.C. 2006. Striking the right balance: students' motivation and affect in elementary mathematics. *Journal of educational research*, 99(5):271-293, May/June.

SCHWINGENDORF, K., HAWKS, J. & BEINEKE, J. 1992. Horizontal and vertical growth of the students' conception of function. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 133-149.)

SELDEN, A. & SELDEN, J. 1992. Research perspectives on conceptions of functions: summary and overview. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 1-16.)

SFARD, A. 1989. Transition from operational to structural conception: the notion of function revisited. (In Vergnaud, G., Rogalski, J. & Artigue, M., eds. Proceedings of the 13th International Conference for the Psychology of Mathematics Education. 3:151-158.)
Besikbaar: ERIC. Datum van gebruik: 22 Aug. 2007.

SFARD, A. 1991. On the dual nature of mathematical conceptions: reflections on processes and objects as different sides of the same coin. *Educational studies in mathematics*, 22:1-36.

SFARD, A. 1992. Operational origins of mathematical objects and the quandary of reification-the case of function. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 59-84.)

SFARD, A. 1994. Reification as the birth of a metaphor. *For the learning of mathematics*, 14(1):44-55, February.

SFARD, A. & LINCHEVSKI, L. 1994. The gains and the pitfalls of reification: the case of algebra. *Educational studies in mathematics*, 26(2-3):191-228.

SHENTON, A.K. 2004. Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22:63-75.

SHERRY, L. & JESSE, D. 2000. The impact of technology on student achievement. http://carbon.cudebver.edu/~lsherry/pubs/tassp_00.htm Datum van gebruik: 22 Aug. 2003.

SHIMIZU, Y. 1996. High achievement versus rigidity: Japanese students' thinking on division of fractions. (In Zhang, D., Sawada, T. & Becker, J., eds. *Proceedings of the China-Japan-U.S. Seminar on Mathematical Education*. Southern Illinois University. p. 223-238.)

SHUARD, H. 1986. Primary mathematics: towards 2000. (1986 Presidential address.) *Mathematical gazette*, 70(453):175-185, October.

SHUELL, T.J. 1990. Teaching and learning as problem solving. *Theory into practice*, 29(2):102-108.

SHUELL, T.J. & FARBER, S.L. 2001. Students' perceptions of technology use in college courses. *Journal for educational computing research*, 24(2):119-138.

SHUELL, T.J. & MORAN, K.A. 1994. Learning theories: historical overview and trends. (In Husén, T. & Postlethwaite, T.N., eds. *The international encyclopaedia of education*, 6:3340-3345. Oxford: Pergamon.)

SHULMAN, L.S. 1986. Those who understand: knowledge growth in teaching. *Educational researcher*, 15(2): 4-14, February.

SHULMAN, L.S. 1987. Knowledge and teaching: foundations of the new reform. *Harvard educational review*, 57(1):1-22, February.

SIEMENS, G. 2004. Connectivism: a learning theory for the digital age. <http://www.elearnspace.org/Articles/connectivism.htm> Datum van gebruik: 1 Okt. 2007.

SIERPINSKA, A. 1991. Some remarks on understanding in mathematics. *For the learning of mathematics*, 10(3):24-36.

SIERPINSKA, A. 1992. On understanding the notion of function. (In Harel, G. & Dubinsky, E., eds. The concept of function: aspects of epistemology and pedagogy. Washington, D.C.: Mathematical Association of America. p. 25-58.)

SILVER, E. 1986. Using conceptual and procedural knowledge: a focus on relationships. (In Hiebert, J., ed. Conceptual and procedural knowledge: the case of mathematics. Hillsdale, N.J.: Erlbaum. p. 181-198.)

SILVER, E.A. 1985. Teaching and learning mathematical problem solving: multiple research perspectives. Hillsdale, N.J.: Erlbaum. 469 p.

SKEMP, R.R. 1971. The psychology of learning mathematics. London: Penguin. 319 p.

SKEMP, R.R. 1978. Relational and instrumental understanding. *Arithmetic teacher*, (26):9-15, November.

SKOURAS, A.S. 2006. Coordinating formal and informal aspects of mathematics in a computer based learning environment. *International journal of mathematical education in science and technology*, 37(8):947-964, December.

SLAVIN, R.E. 2003. Educational psychology: theory and practice. 7th ed. Boston, Mass.: Allyn & Bacon. 613 p.

SLOAN, T., DAANE, C.J. & GIESEN, J. 2002. Mathematics anxiety and learning styles: what is the relationship in elementary preservice teachers? *School science and mathematics*, 102(2). http://findarticles.com/p/articles/mi_qa3667/is_ai_n9080719 Datum van gebruik: 3 Julie 2008.

SMITH, B.S. & SMITH, W.H. 1998. Coping with math anxiety. <http://www.mathacademy.co/pr/minitext/aniety> Datum van gebruik: 26 Junie 2008.

SOUTH AFRICA. Department of Education. 2002. Revised national curriculum statement grades R-9 (schools). Policy: Mathematics. Pretoria: Department of Education. 112 p.

SOUTH AFRICA. Department of Education. 2003. National Curriculum Statement grades 10-12 (general). Policy: Mathematics. Pretoria: Department of Education. 94 p.

SOUTH AFRICA. Department of Education. 2004. National strategy for Mathematics, science and technology education: creating tomorrow's stars today. Implementation Plan 2005-2009. Pretoria: Department of Education.

SOUTHWELL, B. & PENGLASE, M. 2005. Mathematical knowledge of pre-service primary teachers. (*In* Chick, H.L. & Vincent, J.L., eds. Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education, 4:209-216.)

SOUTHWELL, B., WHITE, A.L., WAY, J. & PERRY, B. 2005. Attitudes versus achievement in pre-service mathematics teacher education. www.aare.edu.au/05pap/sou05705.pdf Datum van gebruik: 23 Junie 2006.

SRIRAMAN, B. 2004. Reflective abstraction, unframes and the formulation of generalizations. *Journal of mathematical behaviour*, 23:205-222.

STATSOFT, Inc. 2006. STATISTICA (data analysis software system), version 7.1. www.statsoft.com.

STEELE, D.F. & ARTH, A.A. 1998. Lowering anxiety in the math curriculum. *Education digest*, 63(7):18. March. (6p). Beskikbaar: Academic Search Premier. Datum van gebruik: 29 Sept. 2008.

STEYN, H.S. (jr.). 2005. Handleiding vir bepaling van effekgrootte-indekse en praktiese betekenisvolheid. Potchefstroom: Noordwes-Universiteit (Potchefstroom=kampus). <http://www.puk.ac.za/fakulteite/natuur/skd/index.html> Datum van gebruik: 22 Okt. 2007.

STEYN, T. & DU PLESSIS, I. 2007. Competence in mathematics-more than mathematical skills? *International journal of mathematical education*, 38(7):881-890. October.

STEYN, T.M. & MAREE, J.G. 2002. Graphical exploration of two-dimensional functions-an aid to mastering fundamental calculus concepts. *South African journal of education*, 22(1):47-55.

STODOLSKY, S.S. & GROSSMAN, P.L. 1995. The impact of subject matter on curricular activity: an analysis of five academic subjects. *American educational research journal*, 32(2):227-249, Summer.

STRAUSS, J.P. 1999. Results of the Monitoring Learning Achievement (MLA) Project. Bloemfontein: University of the Free State, Research Institute for Education Planning.

SULLIVAN, P. & McDONOUGH, A. 2002. Teachers differ in their effectiveness. (*In* Cockburn, A.D. & Nardi, E., eds. Proceedings of the 26th Conference of the International Group for the Psychology of Mathematics Education, 4:249-256.)

SWANSON, H.L. 1990. Influence of metacognitive knowledge and aptitude on problem solving. *Journal of educational psychology*, 82(2):306-314.

SWARS, S.L., DAANE, C.J. & GIESEN, J. 2006. Mathematics anxiety and mathematics teacher efficacy: what is the relationship in elementary pre-service teachers? *School science & mathematics*, 106(7):306-315. (10p.) Besikbaar: Academic Search Premier. Datum van gebruik: 29 Junie 2007.

TALL, D. 1996. Information technology and mathematics education: enthusiasms, possibilities and realities. <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot1998c-icme-plenary.pdf> Datum van gebruik: 17 Sept. 2007.

TALL, D. & BAKAR, M.N. 1992. Students' mental prototypes for functions and graphs. <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot1992c-bakar-ijmest.pdf> Datum van gebruik: 10 Des. 2005.

TALL, D., GRAY, E., BIN ALI, M., CROWLEY, L., DeMAROIS, P., McGOWEN, M., PITTA, D., PINTO, M., THOMAS, M. & YUSOF, Y. 2001. Symbols and the bifurcation between procedural and conceptual thinking. *Canadian journal of science mathematics and technology education*, 1:81-104. <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot2001a-symbol-bifurcation.pdf> Datum van gebruik: 20 Sept. 2007.

TALL, D. & RAZALI, M.R. 1993. Diagnosing students' difficulties in learning mathematics. *International journal of mathematical education in science and technology*, 24(2). (19 p.). <http://www.warwick.ac.uk/staff/David.Tall/pdfs/dot1993d-rashidi-ijmest.pdf> Datum van gebruik: 10 Sept. 2007.

TALL, D. & VINNER, S. 1981. Concept image and concept definition in mathematics with particular reference to limits and continuity. *Educational studies in mathematics*, 12(2):151-169, May.

TASHAKKORI, A. & TEDDLIE, C. 1998. Mixed methodology: combining quantitative and qualitative approaches. Thousand Oaks, Calif.: Sage. 185 p.

TASHAKKORI, A. & TEDDLIE, C. 2003a. Issues and dilemmas in teaching research methods courses in social and behavioral sciences: a U.S. perspective. *International journal of social research methodology*, 6(1):61-77.

TASHAKKORI, A. & TEDDLIE, C., eds. 2003b. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif.: Sage.

TATUM, S.B. s.a. Constructivist view of learning. http://www.sjsu.edu/depts/it/tatum/port_exhit/pdf_files/3know/repo188.pdf Datum van gebruik: 28 Aug. 2007.

TAYLOR, J.A. 1999. Undergraduate mathematics and the role of mathematics learning support. (In Spunde, W., Cretchley, P. & Hubbard, R., eds. The challenge of diversity. Proceedings of the D '99 symposium on undergraduate mathematics, Queensland.) <http://eprints.usq.edu.au/1677/1/JTaylorDelta99.pdf> Datum van gebruik: 3 Julie 2008.

TEDDLIE, C. & TASHAKKORI, A. 2003. Major issues and controversies in the use of mixed methods in the social and behavioral sciences. (In Tashakkori, A. & Teddlie, C., eds. Handbook of mixed methods in social and behavioral research. Thousand Oaks, Calif.: Sage. p. 3-50.)

THOMAS, M.O.J. 2003. The role of representation in teacher understanding of function. (In Pateman, N., Dougherty, B.J. & Zilliox, J.T., eds. Proceedings of the 27th Conference of the International Group for the Psychology of Mathematics Education, Honolulu, Hawaii, 4:291-298.)

THOMPSON, A.G. 1984. The relationship of teachers' conceptions of mathematics and mathematics teaching to instructional practice. *Educational studies in mathematics*, 15:105-127.

THOMPSON, A.G. 1992. Teachers' belief and conceptions: a synthesis of research. (In Grouws, D.A., ed. Handbook of research on mathematics teaching and learning: a project of the National Council of Teachers of Mathematics. New York: Macmillan/NCTM. p. 127-143.)

THOMPSON, P.W. 1985. Experience, problem solving and learning mathematics: considerations in developing mathematics curricula. (In Silver, E.A., ed. Teaching and learning mathematical problem solving: multiple research perspectives. Hillsdale, N.J.: Erlbaum. p. 189-236.)

THOMPSON, P.W. 1994. Students, functions, and the undergraduate curriculum. (In Dubinsky, E., Schoenfeld, A.H. & Kaput, J.J., eds. Research in collegiate mathematics education, 1. (Issues in mathematics education, 4). <http://pat-thompson.net/PDFversions/1994StuFunctions.pdf> Datum van gebruik: 13 Sept 2007.

THOMPSON, P.W. & SFARD, A. 1994. Problems of reification: representations and mathematical objects. (In Kirshner, D., ed. Proceedings of the Annual Meeting of the International Group for the Psychology of Mathematics Education - North America, Plenary sessions. Baton Rouge, La.: Louisiana State University, 1:1-32.)

THORNDIKE, E.L. 1922. The psychology of arithmetic. New York, N.Y.:Macmillan. 314 p.

THURSTON, W.P. 2005. Mathematical education. http://www.math.sunysb.edu/~mustopa/thurston_edu.pdf Datum van gebruik: 14 Sept. 2007.

TROCHIM, W.M.K. 2006a. Positivism & Post-positivism. <http://www.socialresearchmethods.net/kb/positivm.php> Datum van gebruik: 15 Aug. 2007.

TROCHIM, W.M.K. 2006b. Research methods knowledge base. <http://www.socialresearchmethods.net/kb/design.php> Datum van gebruik: 15 Aug. 2007.

TRUJILLO, K.M. & HADFIELD, O.D. 1999. Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachers. *College student journal*, 3(2), June. (11p). Besikbaar: Academic search premier. Datum van gebruik: 26 Junie 2008.

TULARAM, A. & KELSON, N. 1998. Assessment in tertiary mathematics. http://www.tedi.uq.edu.au/conferences/A_conf/papers/Tularam.html Datum van gebruik: 1 Julie 2008.

UNDERHILL, R. 1988. Mathematics learners' beliefs. *Focus on learning problems in mathematics*, 10(1):55-69, Fall.

- UUSIMAKI, L. & KIDMAN, G. 2004a. Reducing maths anxiety: results from an online anxiety survey. (In Proceedings AARE Annual Conference, Melbourne, Australia.) <http://www.aare.edu.au/04pap/kid04997.pdf> Datum van gebruik: 14 Aug. 2008.
- UUSIMAKI, L. & KIDMAN, G. 2004b. Challenging maths-anxiety: an intervention model. www.icme-organisiers.dk/tsg24/Documents/UusimakiKidman.doc Datum van gebruik: 14 Aug 2008.
- UUSIMAKI, L. & NASON, R. 2004. Causes underlying pre-service teachers' negative beliefs and anxieties about mathematics. (In Hoinés, M.J. & Fuglestad, A.B., eds. Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education, 4:369-376.)
- VAN AARDT, A. & VAN WYK, C.K. 1993. Student achievement in mathematics. *South African journal of higher education*, 7(3):233-238.
- VAN DEN HEUVEL-PANHUIZEN, M. 2003. The didactical use of models in realistic mathematics education: an example from a longitudinal trajectory on percentage. *Educational studies in mathematics*, 54(1):9-35.
- VAN DER WALT, M.S., MAREE, J.G. & ELLIS, S.M. 2006. 'n Ondersoek na metakognisie in wiskunde-leer in die senior fase. *Suid-Afrikaanse tydskrif vir natuurwetenskap en tegnologie*, 25(3):177-194.
- VAN DYKE, F. & CRAINE, T.V. 1997. Equivalent representations in the learning of algebra. *Mathematics teacher*, 90(8):616-619, November.
- VAN DYKE, F. & WHITE, A. 2004. Examining students' reluctance to use graphs. *Mathematics teacher*, 98(2):110-117, September.
- VAN DER SANDT, S. 2003. The relationship between teachers' knowledge of geometry and the teaching and learning of geometry. Potchefstroom: Potchefstroom University for Christian Higher Education. (Thesis - PhD.) 186 p.
- VERSCHAFFEL, L., GREER, B. & DE CORTE, E. 2000. Making sense of word problems. Lisse: Swets & Zeitlinger. 203 p.
- VINNER, S. 1983. Concept definition, concept image and the notion of function. *International journal of mathematics education in science and technology*, 14(3):293-305.

VINNER, S. 1991. The role of definitions in teaching and learning. (In Tall, D., ed. *Advanced mathematical thinking*. Dordrecht: Kluwer. p. 65-81.)

VINNER, S. 1992. The function concept as a prototype for problems in mathematics learning. (In Harel, G. & Dubinsky, E., eds. *The concept of a function: aspects of epistemology and pedagogy*. Washington, D.C.: Mathematical Association of America. p. 195-214.)

VINNER, S. & DREYFUS, T. 1989. Images and definitions for the concept of function. *Journal for research in mathematics education*, 20(4):356-366.

VINSON, B.M. 2001. A comparison of preservice teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. *Early childhood education journal*, 29(2):89-94, Winter.

VON GLASERSFELD, E. 1987. Learning as a constructive activity. (In Janvier, C., ed. *Problems of representation in the learning and teaching of mathematics*. Hillsdale, N.J.: Erlbaum. p. 3-17.)

VON GLASERSFELD, E. 1989. Constructivism in education. (In Husén, T. & Postlethwaite, T.N., eds. *The international encyclopaedia of education*, Supplementary volume. Oxford: Pergamon. p. 162-163.)

VON GLASERSFELD, E. 1995. Why constructivism must be radical. (In Larochelle, M., Bednarz, N. & Garrison, J., eds. *Constructivism and education*. Cambridge: Cambridge University Press. p. 23-28.)

VON MINDEN, A.M., WALLS, R.T. & NARDI, A.H. 1998. Charting the links between mathematics content and pedagogy concepts: cartographies of cognition. *Journal of experimental education*, 66(4), Summer. (15p.). Beschikbaar: Academic Search Elite. Datum van gebruik: 29 Junie 2007.

WEBER, R. 2004. Editor's comments. The rhetoric of positivism versus interpretivism: a personal view. *MIS quarterly*, 28(1):iii-xii, March.

WEAVER, J.L. & QUINN, R.J. 1999. Geometer's sketchpad in secondary geometry. *Computers in the schools*, 15(2):83-95.

WILCOX, S.K., LANIER, P., SCHRAM, P. & LAPPAN, G. 1992. Influencing beginning teachers' practice in mathematics education: confronting constraints of knowledge, beliefs and context. National Centre for Research on Teacher Learning, East Lansing, Mich.. http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/23/f6/b5.pdf

Datum van gebruik: 29 Junie 2007.

WILKINS, J.L.M. 2002. The impact of teachers' content knowledge and attitudes on instructional beliefs and practices. (In Proceedings of the 24th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Athens, GA, October 26-29.) http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1a/a7/89.pdf Datum van gebruik:

29 Junie 2007.

WILLIAMS, S.R. 1997. Mathematics (Grades 7-12). (In Phye, G.D., ed. Handbook of academic learning. San Diego: Academic Press. p. 343-368.)

WILLIAMS, W.V. 1988. Answers to questions about math anxiety. *School science and mathematics*, 88(2):95-103.

WILLOUGHBY, S.S. 2000. Perspectives on mathematic education. (In Burke, M. J. & Curcio, F.R., eds. Learning mathematics for a new century. NCTM Yearbook. Reston, Va. p. 1-15).

WILSON, J.M., FERNANDEZ, M.L. & HADAWAY, N. 1993. Mathematical problem solving. (In Wilson, P.S. & Wagner, S., eds. Research ideas for the classroom: high school mathematics. New York: Macmillan. p. 57-78.)

WITTRICK, M.C. 1986. Students' thought processes. (In Wittrock, M. C., ed. Handbook of research on teaching. 3rd ed. New York: Macmillan. p. 297-314.)

WOOD, E.F. 1988. Math anxiety and elementary teachers: what does research tell us? *For the learning of mathematics*, 8(1):8-13.

WOOD, L. 2001. The secondary-tertiary interface. (In Holton, D., ed. The teaching and learning of mathematics at university level: an ICME study. Dordrecht: Kluwer. p. 87-98.)

WOOD, T. 1998. Issues relating to the cognitive development of students at historically disadvantaged institutions. *South African journal of higher education*, 12(1):87-93.

WOOD, T., COBB, P. & YACKEL, E. 1991. Change in teaching mathematics: a case study. *American educational research journal*, 28(3):587-616, Fall.

WOODARD, T. 2004. The effects of math anxiety on post-secondary developmental students as related to achievement, gender, and age. *Inquiry*, 9(1), Spring. <http://www.vccaedu.org/inquiry/inquiry-spring2004/i-91-woodard.html> Datum van gebruik: 28 Sept. 2008.

WOOLFOLK, A. 2007. Educational psychology. 10th ed. Boston, Mass.: Pearson. 692 p.

YUSHAU, B., MJI, A. & WESSELS, D.C.J. 2005. The role of technology in fostering creativity in the teaching and learning of mathematics. *Pythagoras*, 62:12-22, December.

ZAN, R. 2000. A metacognitive intervention in mathematics at university level. *International journal of mathematical education in science and technology*, 31(1):143-150.

ZEICHNER, K.M. & TABACHNICK, B.R. 1981. Are the effects of university teacher education "washed out" by school experience? *Journal of teacher education*, 23(3):7-11, May-June.

ZIMMERMAN, B.J. 1995. Self-regulation involves more than metacognition: a social cognitive perspective. *Educational psychologist*, 30(4):217-221.

ZIMMERMAN, B.J. 2002. Becoming a self-regulated learner. *Theory into practice*, 41(2):64-70.

ZULKARDI. 2003. How to design mathematics lessons based on the realistic approach. <http://www.geocities.co./ratuilma/rme.html> Datum van gebruik: 25 Julie 2007.

BYLAAG A

TOESTEMMING DEKAAN



SNS

Tel (018) 2991895

Faks (018) 299 4238

Prof HJ Steyn
Dekaam
Fakulteit Opvoedingswetenskappe

15 Februarie 2006

Geagte Prof Steyn

TOESTEMMING:NAVORSINGSPROJEK

Ek is op die oomblik besig met my PhD (Wiskundeonderwys) en die fokus van die ondersoek is 'n Model vir die konseptuele leer van wiskunde in 'n dinamiese tegnologies-verrykte omgewing by voorgaande wiskunde-onderwysstudente. 'n Verwagte uitkoms van die projek is 'n betekenisvolle bydrae tot die (her-)ontwerp of aanpassing van voordiensopleidingsprogramme vir wiskunde-onderwysers om hulle vlak van konseptuele kennis met betrekking tot funksies tot die verwagte ontwikkelingsvlakke te verhoog, met spesifieke verwysing na 'n realistiese konstruktivistiese leeromgewing. Voorts word 'n artikel of twee in 'n geakkrediteerde vaktydskrif, asook 'n referaat by 'n nasionale vakkongres beplan. Die projek vorm deel van die NRF-ondersteunde SOSI-projek met die promotor, prof Hercules Nieuwoudt, as een van die drie spaniede.

Ek vra hiermee toestemming om die projek ooreenkomstig my goedgekeurde voorlegging binne die Fakulteit Opvoedingswetenskappe aan te pak, en wel in die WSKH 111-module van die eerstejaarsgroep wat Wiskunde as hoofvak neem. Die navorsing sal in deurlopende samewerking met die verantwoordelike personeellede, mev. Heleen Coetzee en mnr. Rudi van de Venter, en onder toesig van die studieleiers, prof. Hercules Nieuwoudt en dr. Susan Nieuwoudt, geskied. Die betrokke dosente sal te alle tye teenwoordig wees, en self die onderrig waarneem. Die bestaande studiegids en module-uitkomste vir WSKH 111 bly van toepassing. Alle leertake wat vir die doeleindes van waarneming aan die leerders gegee word, sal deel wees van die betrokke onderrig-leerprogram en op die bereiking van die module-uitkomste gerig wees.

Daar gaan ook 'n fokusgroep uit die leerders gekies word wat op geskeduleerde tye bymekaar sal kom vir die kwalitatiewe deel van die ondersoek. Al die leerders sal 'n toestemmingsbrief voltooi waarin ek hulle toestemming sal verkry om die navorsing uit te voer – hulle deelname bly te alle tye vrywillig.

By voorbaat dankie vir die gunstige oorweging van die aansoek.

Annalie Roux

Lektor: SNS (Wiskunde)

PhD-student (12040177)



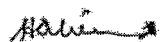
POTCHEFSTROOMKAMPUS
Privaatsak X6001, Potchefstroom, 2520
Tel: (018) 299-1111 • Faks: (018) 299-2799
Internet: <http://www.nwu.ac.za>



Die Potchefstroomse Universiteit vir Christelike Hoër Onderwys en die University of North-West het op 1 Januarie 2004 ingevolge artikel 23(1) van die Wet op Hoër Onderwys (Wet no. 101 van 1997), soos gewysig, saamgestel en die Noordwes-Universiteit te vorm, ingevolge artikel 24(1) van die Wet op Hoër Onderwys (Wet no. 101 van 1997), soos gewysig, is die personeel en studente van die Sebokeng-kampus van Vista op 2 Januarie 2004 by die Noordwes-Universiteit geïntegreer.

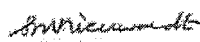
Verklaring deur promotors:

Ons ondersteun mev. Roux se projek, wat binne die gestelde oorhoofse navorsingsprojek val, en beveel haar bostaande versoek graag by u aan.



Hercules Nieuwoudt

Promotor



Susan Nieuwoudt

Medepromotor

BYLAAG B

TOESTEMMING DEELNEMERS

Invloed van 'n tegnologies-verrykte omgewing op konseptualisering

Jy word gevra om deel te neem aan 'n navorsingsprojek aangaande die invloed van dinamies-tegnologies-verrykte omgewing op konseptualisering rakende funksies. Ons hoop dat die resultate van hierdie studie nuttig kan wees, en uiteindelik kan lei tot die daarstelling van 'n model vir die konseptuele leer van wiskunde in 'n dinamies-tegnologies-verrykte omgewing by voorgraadse wiskunde-onderwysstudente.

As 'n toekomstige wiskunde-onderwyser is dit belangrik dat jy 'n diepgaande kennis van funksies sal hê, maar ook dat jy 'n positiewe gesindheid en houding teenoor wiskunde as vak sal openbaar. Jou deelname kan vir ons 'n beeld gee van watter rol tegnologie speel in die verbetering van jou konseptualisering aangaande funksies, asook die rol van tegnologie in die verandering van jou houding en oortuigings aangaande wiskunde.

As jy instem tot deelname aan die projek, sal jy twee vraelyste voltooi aan die begin van die semester, en twee aan die einde van die semester. Een vraelys sal telkens handel oor funksies (ongeveer 30 minute), en die ander 'n vraelys oor studie-oriëntering in wiskunde (ook ongeveer 30 minute).

Deelname aan die projek is anoniem, en sal streng vertroulik hanteer word. Jou antwoorde in hierdie vraelyste sal op geen manier jou prestasie in die module WSKH 111 beïnvloed nie, alhoewel die toets aangaande funksies deel uitmaak van die uitkomst wat in hierdie module bereik word. Jou deelname aan hierdie projek is vrywillig. As jy op enige stadium aan deelname wil onttrek, staan dit jou vry om dit te doen, sonder benadeling van jouself.

Magtiging:

Ek het bostaande deurgelees, en verstaan die aard van hierdie studie. Ek ondemeem om deel te neem aan die studie. Ek verstaan ook dat deelname vrywillig is, en dat ek te enige tyd aan die projek kan onttrek, sonder dat ek benadeel word. Ek verstaan ook dat, as ek vrae het, ek die navorser, Mev Annalie Roux, te enige tyd kan kontak by 084 580 5989, of die studieleiers van hierdie navorsingsprojek, Prof Hercules Nieuwoudt, (299 1902) of dr Susan Nieuwoudt (299 1912)

Deelnemer se handtekening: _____ Datum: _____

Navorser se handtekening: _____ Datum: _____

BYLAAG C: FUNKSIE-VOORTOETS

VRAELYS 1: FUNKSIES

--

Merk die toepaslike blokkie

1.

1e jaar	2e jaar	3e jaar
---------	---------	---------

2.

Manlik	Vroulik
--------	---------

3.

Grondslagfase	Intermediêr en seniorfase	Senior en VOO-fase
---------------	---------------------------	--------------------

4.

Wiskunde hoofvak	Wiskunde leerarea
------------------	-------------------

5. Jou ander hoofvak (indien van toepassing): _____

6. Jaar matriek geskryf: _____

7. Matrieksimbool vir wiskunde: _____

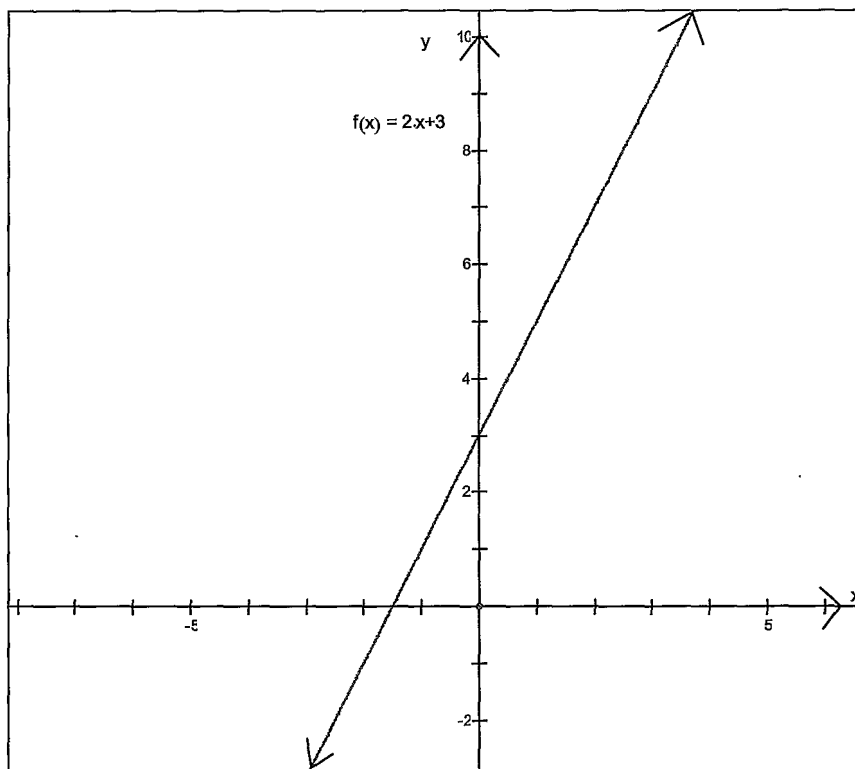
8.

HG	SG
----	----

Instruksies:

- Beantwoord die vrae so volledig as moontlik op die vraestel self
- As jy 'n vraag nie kan beantwoord nie, gaan solank aan na die volgende vraag, en kom weer terug na die betrokke vraag
- Baie dankie vir jou samewerking

1. Gegee die vergelyking $y = 2x + 3$ en die grafiek daarvan:



- a) Wat is die waarde van x as $y = 9$? _____
- b) Kan jy die waarde van x op 'n ander manier bepaal? Verduidelik jou antwoord
2. Die volgende tabel gee die waarde (W) van 'n motor vir die aantal jare (t) nadat dit gekoop is:

t	W
0	R160 000
2	R135 000
4	R110 000
6	R85 000

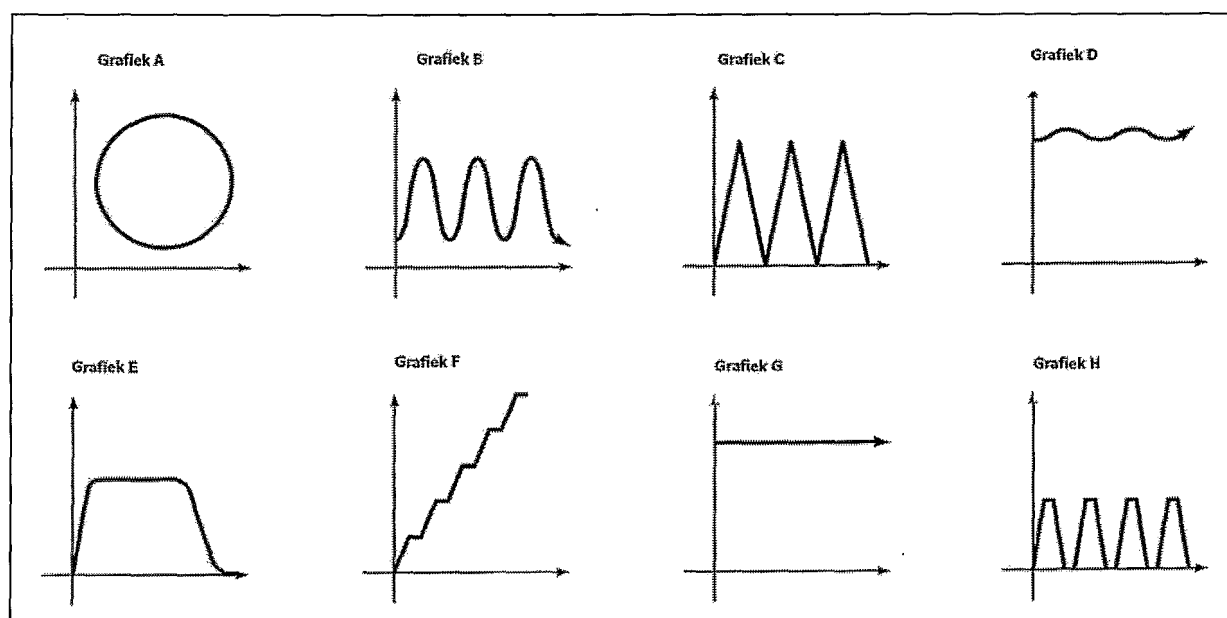
Gee 'n simboliese reël waar W uitgedruk word as 'n funksie van t

3. 'n Vragmotor is gelaai met kartonbokse, waarvan elkeen 10 kg weeg. As die leë vragmotor 2000 kg weeg, bepaal die volgende:
- (d) Die totale gewig van die vragmotor as daar 75 bokse is
 - (e) Die aantal bokse as die totale gewig van die vragmotor 3000 kg is
 - (c) Deur G te gebruik as die totale gewig van die vragmotor en x vir die aantal bokse, skryf 'n vergelyking neer wat die gewig uitdruk as 'n funksie van die aantal bokse.
4. 'n Klein maatskappy bepaal sy bydrae tot liefdadigheid (B) deur sy wins (w), wat afhanklik is van die aantal items (n) wat verkoop word, volgens die volgende formules:

$$B = 0,1(w - 1000) \text{ en } w = 100n - n^2$$

- (c) Wat sal die maatskappy bydra tot liefdadigheid as hy 50 items verkoop?
 - (d) Skryf 'n formule neer wat B uitdruk as 'n funksie van n
5. Kies uit A-H die grafiek van afstand as 'n funksie van tyd wat by elkeen van die gegewe situasies pas, bv 6F
- 5.1 'n Persoon wat op 'n "Big Wheel" ry (die persoon se afstand vanaf die grond)
 - 5.2 Iemand wat 'n naelloop hardloop (sy afstand vanaf die beginpunt)

- 5.3 Die aarde se afstand vanaf die son
- 5.4 Die vlug van 'n ruimtetuig (die ruimtetuig se afstand vanaf die aarde)
- 5.5 'n Persoon ry op 'n roltrap na die boonste vloer (persoon se afstand vanaf die grond)



Situasie	Grafiek
5.1	
5.2	
5.3	
5.4	
5.5	

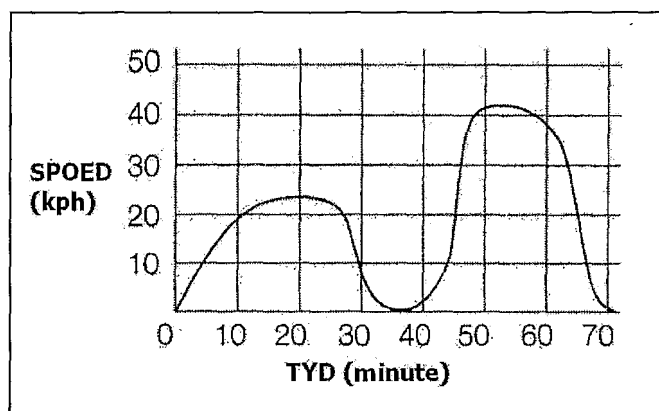
6. 'n Skaapboud word uit die yskas gehaal en in die oond gesit. Die volgende is 'n tabel van die temperatuur van die skaapboud in grade Celsius (C) opgeteken gedurende die eerste 120 min.

Minute	0	10	20	30	60	120
Celsius	50	100	140	170	200	220

Teken 'n grafiek van hierdie situasie.

7. Michael werk by 'n winkel wat elektriese toebehore verkoop. Hy word R25 per uur betaal, en werk 8 ure per dag. Daarmee saam verdien hy 3% kommissie op alles wat hy verkoop. Laat x die totale waarde van die goedere wat hy per dag verkoop aandui. Definieer 'n funksie g wat Michael se totale inkomste per dag aandui.
8. Jenny en Pamela besluit om na Varsité-Burger toe te gaan vir middagete. Elkeen het 'n R2-afslag-koepon van die kampuskoerant vir die "Double-deluxe –meal" wat R20,00 kos. As hulle egter hul studentekaarte wys, kry hulle 'n verdere 10% afslag. 'n Assistent lui Pamela se bestelling op as die "Double-deluxe –meal", afslagkoepon, en dan 10% afslag. Jenny se bestelling word gelui as die "Double-deluxe –meal", 10% afslag, en dan afslagkoepon.
- Hoeveel betaal elkeen vir haar burger?
 - Skryf 'n funksie $C(x)$ wat R2 sal aftrek van die prys x
 - Skryf 'n funksie $D(x)$ wat 10% sal aftrek van die prys x
 - Bepaal $C(D(x))$ en $D(C(x))$
 - Watter assistent (Pamela of Jenny s'n) het $C(D(x))$ gebruik om die prys van die "Double-deluxe –meal" te bepaal?

9. Die grafiek hieronder gee die spoed van 'n fietsryer op sy daaglikse oefenrit. Gedurende hierdie rit moet hy teen 'n opdraande uitry, waar hy dan vir 'n slukkie Energade stilhou, voordat hy weer teen 'n afdraande afry. Gebruik die grafiek om die volgende vrae te beantwoord:



- Bepaal die spoed as die tyd 25 minute is
- Bepaal die tyd wanneer die spoed 30 km/h is
- Gedurende watter tydsintervalle neem die spoed toe?
- Gedurende watter 10-minute tydsinterval het die spoed die meeste afgeneem?
- Wanneer was die fietsryer aan die bopunt van die opdraande?

10. 'n Tuinier plant 'n nuwe grassoort en hou rekord van die hoogte van die gras gedurende die eerste twee weke.:

Tyd (dae)	0	3	7	10	14
Hoogte (cm)	4,2	6,3	9,1	11,2	14

- Hoeveel groei die gras daaglik?
- Skryf 'n formule wat die hoogte van die gras na n dae gee
- Hoe lank sal dit vir die gras neem om 'n hoogte van 28 cm te bereik?

11. Ben wil geld insamel vir sy studies deur worsbroodjies te verkoop vanuit 'n koswaentjie voor 'n gebou. Hy betaal die eienaar van die koswaentjie R35,00 per dag vir die gebruik van die waentjie. Hy verkoop die worsbroodjies teen R4 elk. Die koste per worsbroodjie is R2,50.

- a) Stel 'n tabel op waarin die aantal worsbroodjies wat verkoop word en die wins aangedui word:

Aantal worsbroodjies verkoop	Wins

- b) Teken dan 'n grafiek van hierdie situasie
- c) Hoeveel worsbroodjies moet hy verkoop om gelyk te breek?
- d) Hoeveel worsbroodjies moet hy verkoop om 'n wins van R100,00 te maak?
12. Die aantal mense wat langs die kus woon beïnvloed die aantal walvisse in die nabygeleë kuswater, omdat die walvisse nie hou van die geraas wat die mense maak nie. Omdat walvisse plankton eet, het die aantal walvisse 'n effek op die aantal plankton in die see. Gestel die aantal mense (in duisende) word deur x voorgestel, en die aantal walvisse deur y . 'n Eenvoudige model wat die verband aantoon tussen die aantal mense en die aantal walvisse word gegee deur : $y = f(x) = -\frac{x}{2} + 1000$. As z die hoeveelheid plankton weergee, is 'n eenvoudige model $z = g(y) = -\frac{y}{5} + 400$.
- a) Bereken 'n saamgestelde funksie h wat die hoeveelheid plankton in terme van die aantal mense in duidende weergee.
- b) Bereken dan die hoeveelheid plankton as die populasie 300 000 is.

BYLAAG D: FUNKSIE-NATOETS

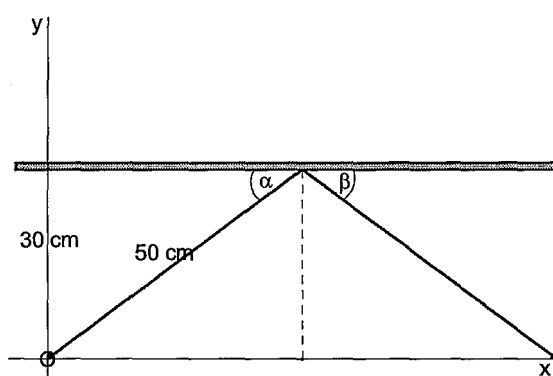
FUNKSIEVRAELYS 2

STUDENTENOMMER:

Vraag 1

In 'n eksperiment in 'n donkerkamer word die bekende wet dat 'n invalshoek gelyk is aan die weerkaatsingshoek gedemonstreer. Vanaf 'n bron O word 'n ligstraal na 'n spieël gestuur en hoeke α en β word gemeet. Die loodregte afstand tussen die ligbron en die spieël is 30 cm en die lig beweeg 50 cm tot by die spieël.

Lei 'n formule af waarmee die pad van die lig gemodelleer kan word.



[5]

Vraag 2

Gestel Fanie het 'n massa van 75 kg. Dan het Fanie 'n gewig van 750 N (newton) op die oppervlak van die aarde. Massa is konstant (behalwe as Fanie op 'n dieet gaan), maar sy gewig word bepaal deur die aantrekkingskrag van die aarde. As Fanie bokant die oppervlak van die aarde is, is sy gewig omgekeerd eweredig aan die kwadraat van die afstand na die middelpunt van die aarde af. Dit gebeur omdat die gravitasiekrag tussen Fanie en die aarde afneem as hy verder weg is. Onder die oppervlak van die aarde is Fanie se gewig direk eweredig aan die afstand na die middelpunt van die aarde. In die middelpunt sal Fanie "gewigloosheid" beleef, omdat die aarde se gravitasie hom ewe sterk in alle rigtings aantrek. Neem die aarde se radius as 6380 km.



[HTTP://WWW.NO-VATIONS.COM/NOVATIONS/NSD/C/IMAGES/MAN%20ON%20EARTH-SMALL.JPG](http://www.NO-VATIONS.COM/NOVATIONS/NSD/C/IMAGES/MAN%20ON%20EARTH-SMALL.JPG)

Gewig, y as funksie van die afstand onder of bokant die aarde se oppervlakte word gegewe deur:

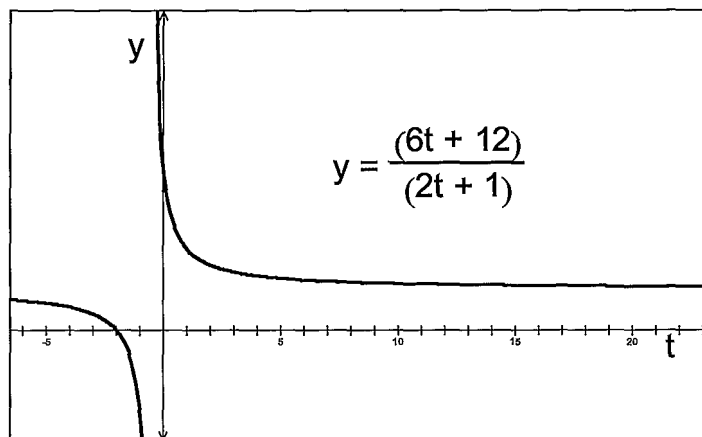
$$y = f(x) = \begin{cases} ax & \text{as } 0 \leq x \leq 6380 \\ \frac{b}{x^2} & \text{as } x \geq 6380 \end{cases} \quad ; \text{ met } x \text{ die afstand vanaf die middelpunt van die aarde in km}$$

- 2.1 Bereken die waardes van a en b vir $y = 750$ en $x = 6380$. (5)
- 2.2 Teken 'n sketsgrafiek van f . (6)
- 2.3 Bereken Fanie se gewig 100 km onder die aardoppervlakte. (3)
- 2.4 Bereken Fanie se gewig 100 km bokant die aardoppervlakte. (3)
- 2.5 Watter gevolgtrekking kan jy uit bogenoemde twee antwoorde maak? (2)

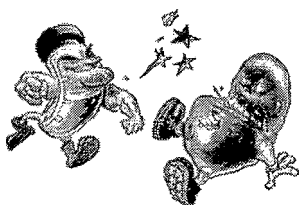
II

Vraag 3

Beskou die grafiek van $y = f(t)$ en beantwoord die volgende vrae:



- 3.1 Gee die definisieversameling van f . (Toon alle bewerkings) (4)
- 3.2 Gee die vergelyking van die vertikale asimptoot van f . (1)
- 3.3 Bereken die y -afsnit. (2)
- 3.4 Bereken die inverse van f indien moontlik. (4)



www.el-bulbo.com

Gestel f modelleer die populasie y (in duisende) van 'n kolonie bakterieë na t ure.

- 3.5 Gee nog 'n beperking wat u nou op t moet plaas. (1)
- 3.6 Wat is die lewenswerklike betekenis van die y -afsnit? (1)

[17]

VRAAG 4

Veronderstel 'n vervaardiger weet dat die daaglikse produksiekoste om x fietse te maak, voorgestel word deur die funksie C , met

$$C(x) = 100 + 450x - 5x^2 \quad (0 \leq x \leq 40).$$

M.a.w. $C(x)$ stel die koste in Rand voor om x fietse te vervaardig.

Veronderstel ook dat die aantal fietse wat in t ure vervaardig kan word deur die funksie

$$x = f(t) = 5t \quad (0 \leq t \leq 8)$$

gemodelleer word.



<http://office.microsoft.com/clipart/results.aspx?lc=en-gb&Scope=MC%2CMM%2CMP%2CMS&Query=bicycle#60>

- 4.1 Bepaal die saamgestelde funksie $C \circ f$ (4)
- 4.2 Bereken die produksiekoste op 'n dag as die fabriek net 3 ure in werking is deur 9.1 te gebruik. (2)
- 4.3 Verdubbel die koste as die fabriek 6 ure lank fietse vervaardig? Motiveer jou antwoord. (2)

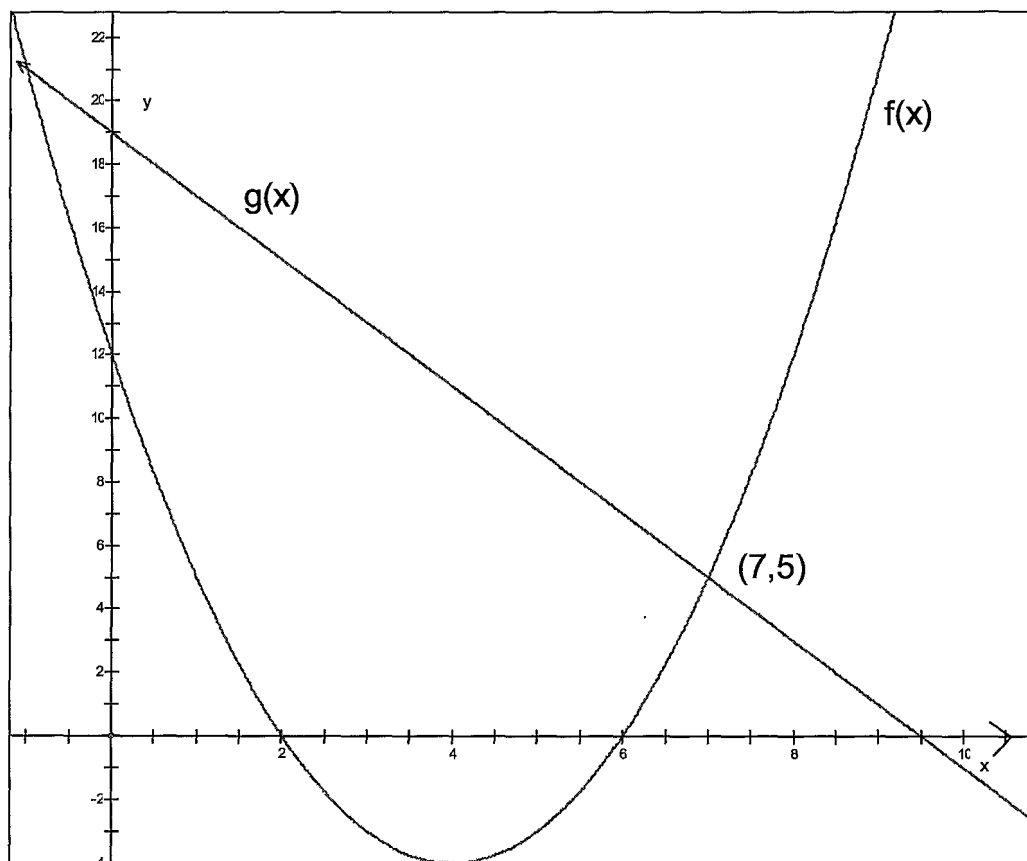
[8]

BYLAAG E: TAAKGEBASEERDE ONDERHOUE

STUDENTENOMMER: _____

VRAAG 1

1. Beskou die volgende grafiek en die vrae wat daarop volg. Moet dit egter nie nou beantwoord nie



- (a) Wat beteken $(7,5)$ op hierdie grafiek?
- (b) Watter van die volgende bewerings is korrek?
- (i) $f(7) = g(5)$
- (ii) $f(5) = g(5)$
- (iii) $f(7) = g(7)$
- (iv) Meer inligting is nodig
- (c) Bepaal nou die vergelyking van die parabool en van die reguit lyn.

2. Dink jy dat jy die probleem korrek sal kan oplos? Omkring jou keuse.

a.	Ek is doodseker dat ek die probleem korrek sal kan oplos.
b.	Ek is redelik seker dat ek die probleem korrek sal kan oplos.
c.	Ek is nie seker hoe korrek ek die probleem sal kan oplos nie.
d.	Ek is regtig nie seker dat ek die probleem sal kan oplos nie. Ek dink ek gaan heel waarskynlik 'n fout maak.
e.	Ek weet dat ek 'n fout gaan maak wanneer ek die probleem oplos.

3. Verduidelik in woorde hoe jy te werk sal gaan om 1(c) op te los

4. Voltooi nou die vrae wat na die grafiek volg, en toon jou stappe by (c):

(a) Wat beteken (7,5) op hierdie grafiek?

(b) Watter van die volgende stellings is korrek? Omkring die regte een

(i) $f(7) = g(5)$

(ii) $f(5) = g(5)$

(iii) $f(7) = g(7)$

(iv) Meer inligting is nodig

(c) Bepaal nou die vergelyking van die parabool en van die reguit lyn.

5. Jy het die vraag nou beantwoord. Hoe seker is jy dat jy die vraag reg gedoen het?

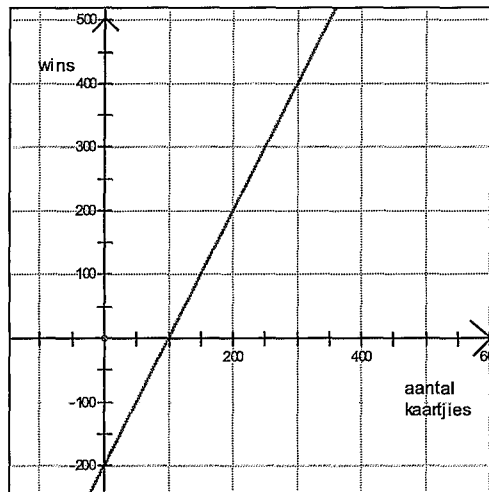
a.	Ek is doodseker dat ek die probleem korrek opgelos het.
b.	Ek is redelik seker dat ek die probleem korrek opgelos het.
c.	Ek is nie seker dat ek die probleem korrek opgelos het nie.
d.	Ek is nie seker of ek die probleem korrek opgelos het nie. Ek dink ek het dalk 'n fout gemaak.
e.	Ek weet dat ek 'n fout gemaak het.

6. Dink na oor wat jy gedoen het, en beskryf die strategieë of planne wat jy gebruik het in die oplos van die probleem

7. Watter soort foute maak jy gewoonlik as jy die vergelyking van 'n reguit lyn of parabool bepaal?

VRAAG 2

2. Beskou die volgende grafiek en die daaropvolgende vrae. Moet dit egter nie nou al beantwoord nie



Die grafiek toon die wins van 'n Valentynsbal as 'n lineêre funksie van die aantal kaartjies wat verkoop is.

Deur na die grafiek te kyk, beantwoord die volgende vrae:

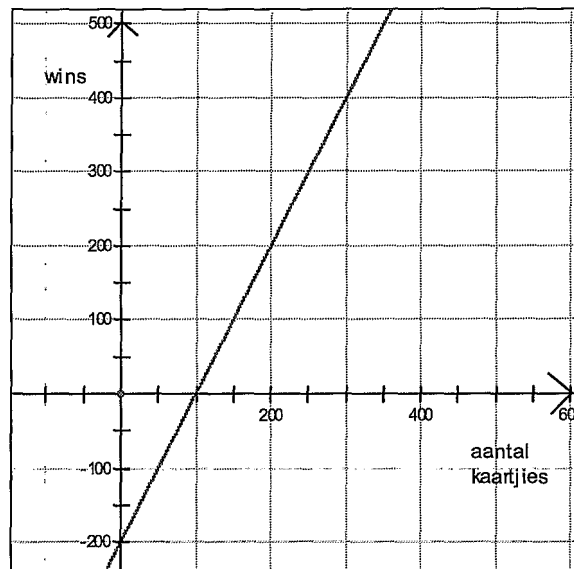
- (a) Hoeveel kaartjies moet hulle verkoop voordat hulle 'n wins maak?
- (h) Bepaal die koste van 'n kaartjie
- (i) Bepaal die helling van die grafiek
- (j) Wat word deur die helling van die grafiek voorgestel?
- (k) Wat is die koste van die funksie nog voordat enige kaartjie verkoop is? (M.a.w. die oorhoofse koste)
- (l) Definieer 'n funksie wat die wins uitdruk as 'n funksie van die aantal kaartjies wat verkoop is

2. Dink jy dat jy die probleem korrek sal kan oplos? Omkring jou keuse.

a.	Ek is doodseker dat ek die probleem korrek sal kan oplos.
b.	Ek is redelik seker dat ek die probleem korrek sal kan oplos.
c.	Ek is nie seker hoe korrek ek die probleem sal kan oplos nie.
d.	Ek is regtig nie seker dat ek die probleem sal kan oplos nie. Ek dink ek gaan heel waarskynlik 'n fout maak.
e.	Ek weet dat ek 'n fout gaan maak wanneer ek die probleem oplos.

3. Verduidelik watter planne jy sal maak, of hoe jy te werk sal gaan om die vraag te beantwoord

4. Beantwoord nou die vrae



Die grafiek toon die wins van 'n Valentynsbal as 'n lineêre funksie van die aantal kaartjies wat verkoop is. Deur na die grafiek te kyk, beantwoord die volgende vrae:

(a) Hoeveel kaartjies moet hulle verkoop voordat hulle 'n wins maak?

(b) Bepaal die koste van 'n kaartjie

(c) Bepaal die helling van die grafiek

(d) Wat word deur die helling van die grafiek voorgestel?

(e) Wat is die koste van die funksie nog voordat enige kaartjie verkoop is? (M.a.w. die oorhoofse koste)

(f) Definieer 'n funksie wat die wins uitdruk as 'n funksie van die aantal kaartjies wat verkoop is.

5. Jy het die vraag nou beantwoord. Hoe seker is jy dat jy die vraag reg gedoen het?

a.	Ek is doodseker dat ek die probleem korrek opgelos het.
b.	Ek is redelik seker dat ek die probleem korrek opgelos het.
c.	Ek is nie seker dat ek die probleem korrek opgelos het nie.
d.	Ek is nie seker of ek die probleem korrek opgelos het nie. Ek dink ek het dalk 'n fout gemaak.
e.	Ek weet dat ek 'n fout gemaak het.

6. Dink na oor wat jy gedoen het, en beskryf die strategieë of planne wat jy gebruik het in die oplos van die probleem

7. Waarom dink jy het jy dalk foute gemaak in die oplos van die probleem?

VRAAG 3

1. Beskou die volgende probleem, maar moet nog nie die vrae beantwoord nie

Jenny en Pamela besluit om na Varsité-Burger toe te gaan vir middagete. Elkeen het 'n R2-afslag-koepon van die kampuskoerant vir die "Double-deluxe -meal" wat R20,00 kos. As hulle egter hul studentekaarte wys, kry hulle 'n verdere 10% afslag. 'n Assistent lui Pamela se bestelling op as die "Double-deluxe -meal", afslagkoepon, en dan 10% afslag. Jenny se bestelling word gelui as die "Double-deluxe -meal", 10% afslag, en dan afslagkoepon.

- Hoeveel betaal elkeen vir haar burger? Toon aan hoe jy dit bereken
- Skryf 'n funksie $C(x)$ wat R2 sal aftrek van die prys x
- Skryf 'n funksie $D(x)$ wat 10% sal aftrek van die prys x
- Bepaal $C(D(x))$ en $D(C(x))$
- Watter assistent (Pamela of Jenny s'n) het $C(D(x))$ gebruik om die prys van die "Double-deluxe -meal" te bepaal?

2. Dink jy dat jy die probleem korrek sal kan oplos? Omkring jou keuse.

a.	Ek is doodseker dat ek die probleem korrek sal kan oplos.
b.	Ek is redelik seker dat ek die probleem korrek sal kan oplos.
c.	Ek is nie seker hoe korrek ek die probleem sal kan oplos nie.
d.	Ek is regtig nie seker dat ek die probleem sal kan oplos nie. Ek dink ek gaan heel waarskynlik 'n fout maak.
e.	Ek weet dat ek 'n fout gaan maak wanneer ek die probleem oplos.

3. Verduidelik watter planne jy sal maak, of hoe jy te werk sal gaan om die vraag te beantwoord

4. Beantwoord nou die vrae

Jenny en Pamela besluit om na Varsité-Burger toe te gaan vir middagete. Elkeen het 'n R2-afslag-koepon van die kampuskoerant vir die "Double-deluxe -meal" wat R20,00 kos. As hulle egter hul studentekaarte wys, kry hulle 'n verdere 10% afslag. 'n Assistent lui Pamela se bestelling op as die "Double-deluxe -meal", afslagkoepon, en dan 10% afslag. Jenny se bestelling word gelui as die "Double-deluxe -meal", 10% afslag, en dan afslagkoepon.

(a) Hoeveel betaal elkeen vir haar burger? Toon aan hoe jy dit bereken

(b) Skryf 'n funksie $C(x)$ wat R2 sal aftrek van die prys x

(c) Skryf 'n funksie $D(x)$ wat 10% sal aftrek van die prys x

(d) Bepaal $C(D(x))$ en $D(C(x))$

(e) Watter assistent (Pamela of Jenny s'n) het $C(D(x))$ gebruik om die prys van die "Double-deluxe -meal" te bepaal?

5. Jy het die vraag nou beantwoord. Hoe seker is jy dat jy die vraag reg gedoen het?

a.	Ek is doodseker dat ek die probleem korrek opgelos het.
b.	Ek is redelik seker dat ek die probleem korrek opgelos het.
c.	Ek is nie seker dat ek die probleem korrek opgelos het nie.
d.	Ek is nie seker of ek die probleem korrek opgelos het nie. Ek dink ek het dalk 'n fout gemaak.
e.	Ek weet dat ek 'n fout gemaak het.

6. Dink na oor wat jy gedoen het, en beskryf die strategieë of planne wat jy gebruik het in die oplos van die probleem.

7. Waarom het jy dalk foute gemaak in die oplos van die probleem, of watter soort fout(e) het jy dalk gemaak?

VRAAG 4

1. Beskou die volgende tabel en die vrae wat daarop volg. Moenie nou al beantwoord nie.

Die tabel gee die waarde (W) van 'n motor vir die aantal jare (t) nadat dit gekoop is:

T	W
0	R160 000
2	R135 000
4	R110 000
6	R85 000

- (a) Wat sou jy voorspel sal die motor se waarde 10 jaar nadat dit gekoop is, wees?
- (b) Skryf 'n vergelyking neer waarin die waarde W uitgedruk word as 'n funksie van t.

2. Dink jy dat jy die probleem korrek sal kan oplos? Omkring jou keuse.

a.	Ek is doodseker dat ek die probleem korrek sal kan oplos.
b.	Ek is redelik seker dat ek die probleem korrek sal kan oplos.
c.	Ek is nie seker hoe korrek ek die probleem sal kan oplos nie.
d.	Ek is regtig nie seker dat ek die probleem sal kan oplos nie. Ek dink ek gaan heel waarskynlik 'n fout maak.
e.	Ek weet dat ek 'n fout gaan maak wanneer ek die probleem oplos.

3. Verduidelik watter planne jy sal maak, of hoe jy te werk sal gaan om die vraag te beantwoord

4. Beantwoord nou die vrae

Die tabel gee die waarde (W) van 'n motor vir die aantal jare (t) nadat dit gekoop is:

t	W
0	R160 000
2	R135 000
4	R110 000
6	R85 000

- (a) Wat sou jy voorspel sal die motor se waarde 10 jaar nadat dit gekoop is, wees?

- (b) Skryf 'n vergelyking neer waarin die waarde W uitgedruk word as 'n funksie van t

5. Jy het die vraag nou beantwoord. Hoe seker is jy dat jy die vraag reg gedoen het?

a.	Ek is doodseker dat ek die probleem korrek opgelos het.
b.	Ek is redelik seker dat ek die probleem korrek opgelos het.
c.	Ek is nie seker dat ek die probleem korrek opgelos het nie.
d.	Ek is nie seker of ek die probleem korrek opgelos het nie. Ek dink ek het dalk 'n fout gemaak.
e.	Ek weet dat ek 'n fout gemaak het.

6. Dink na oor wat jy gedoen het, en beskryf die strategieë of planne wat jy gebruik het in die oplos van die probleem.

7. Waarom het jy dalk foute gemaak in die oplos van die probleem, of watter soort fout(e) het jy dalk gemaak?

VRAAG 5

1. Lees deur die volgende probleem, maar moet dit nog nie oplos nie:

Ben wil geld insamel vir sy studies deur worsbroodjies te verkoop vanuit 'n koswaentjie voor 'n gebou. Hy betaal die eienaar van die koswaentjie R35,00 per dag vir die gebruik van die waentjie. Hy verkoop die worsbroodjies teen R4 elk. Die koste per worsbroodjie is R2,50.

- (a) Hoeveel worsbroodjies moet hy verkoop om gelyk te breek?
- (b) Wat is sy wins as hy 130 worsbroodjies verkoop?
- (c) Hoeveel worsbroodjies moet hy verkoop om 'n wins van R100 te maak?
- (d) Skryf 'n vergelyking neer wat die wins uitdruk as 'n funksie van die

2. Dink jy dat jy die probleem korrek sal kan oplos? Omkring jou keuse.

a.	Ek is doodseker dat ek die probleem korrek sal kan oplos.
b.	Ek is redelik seker dat ek die probleem korrek sal kan oplos.
c.	Ek is nie seker hoe korrek ek die probleem sal kan oplos nie.
d.	Ek is regtig nie seker dat ek die probleem sal kan oplos nie. Ek dink ek gaan heel waarskynlik 'n fout maak.
e.	Ek weet dat ek 'n fout gaan maak wanneer ek die probleem oplos.

3. Verduidelik watter planne jy sal maak, of hoe jy te werk sal gaan om die vraag te beantwoord

4. Los nou die probleem op. Jy kan dit op 'n aparte bladsy doen

Ben wil geld insamel vir sy studies deur worsbroodjies te verkoop vanuit 'n koswaentjie voor 'n gebou. Hy betaal die eienaar van die koswaentjie R35,00 per dag vir die gebruik van die waentjie. Hy verkoop die worsbroodjies teen R4 elk. Die koste per worsbroodjie is R2,50.

- (a) Hoeveel worsbroodjies moet hy verkoop om gelyk te breek?
- (b) Wat is sy wins as hy 130 worsbroodjies verkoop?
- (c) Hoeveel worsbroodjies moet hy verkoop om 'n wins van R100 te maak?

5. Jy het die vraag nou beantwoord. Hoe seker is jy dat jy die vraag reg gedoen het?

a.	Ek is doodseker dat ek die probleem korrek opgelos het.
b.	Ek is redelik seker dat ek die probleem korrek opgelos het.
c.	Ek is nie seker dat ek die probleem korrek opgelos het nie.
d.	Ek is nie seker of ek die probleem korrek opgelos het nie. Ek dink ek het dalk 'n fout gemaak.
e.	Ek weet dat ek 'n fout gemaak het.

6. Dink na oor wat jy gedoen het, en beskryf die strategieë of planne wat jy gebruik het in die oplos van die probleem.

7. Waarom het jy dalk foute gemaak in die oplos van die probleem, of watter soort fout(e) het jy dalk gemaak? Waarom kon jy dalk van die vrae nie beantwoord nie?

BYLAAG F

Semi-gestruktureerde Onderhoude

- 1.1 Hoe het julle wiskunde op skool ervaar?
- 1.2 Het julle op hoërskool ervaar dat julle meer roetine-prosedures gevolg het sonder dat jy regtig eintlik weet hoekom jy dit doen?
2. Hoe beleef julle wiskunde nou op universiteit gedurende die eerste semester?
3. Hoe voel jy wanneer jy besig is met 'n wiskunde-opdrag?
Gestimuleer, bekommerd, onentoesiasties, selfversekerd, verveeld, vasberade?
4. Hoe voel jy wanneer jy 'n struikelblok teëkom in die uitvoer van 'n probleem, en wat doen jy gewoonlik?
Ontmoedig, kan nie omgee, gefrustreerd, skaam, gemotiveer, geïrriteerd
5. Hoe belangrik is voorbereiding vir die kontakssessies/
6. Hoe belangrik beskou julle die volgende in die leer van wiskunde?
 - 6.1 Die leer van wiskundefakte
 - 6.2 Maniere om hoofrekene bewerkings te kan doen
 - 6.3 Die leer van standaard wiskundeprosedures
 - 6.4 Die leer van metodes van probleemoplossing
 - 6.5 Die vermoë om bekende wiskunde in onbekende kontekste toe te pas
 - 6.6 Die vermoë om wiskunde aan ander te verduidelik
 - 6.7 Die vermoë om wiskundige benaderings te improviseer in die oplos van probleme
7. Hoe sou jy wiskunde definieer?
8. Hoe leer jy wiskunde?
9. Hoekom het julle wiskunde as hoofvak gekies?
10. Dink jy die feit dat jy Wiskunde op Standaardgraad gehad het, het jou benadeel?
11. Hoe voel jy daaroor om wiskunde te gee eendag?
12. Moet 'n onderwyser goed kan verduidelik, of moet leerders deur gepaste take toegelaat word om hulle eie begrip te vorm?

- 13 Hoe het julle die gebruik van tegnologie, Geometer's Sketchpad, ervaar
- 14 Is daar begrippe of konsepte wat vir julle duideliker geword het met die gebruik van tegnologie?
- 15 Dink julle dit is steeds belangrik om te weet hoe om 'n grafiek met die hand te teken, al is tegnologie beskikbaar?
- 16 Hoe het die dosente tegnologie gebruik in die onderrig van wiskunde?
- 17 Hoe het julle houding teenoor wiskunde verander met die gebruik van tegnologie?

BYLAAG G

Voorbeelde van aktiwiteite wat die eksperimentele groep voltooi het

Voorbeeld 1 van aktiwiteit: gemiddelde en oombliklike snelheid

1. Teken m.b.v. GSP 'n verplasing-tydgrafiek van die bal vir die eerste 7 sekondes.

Bereken die volgende m.b.v. die grafiek:

- 1.1 Die gemiddelde snelheid oor die tydsintervalle [5; 7], [5; 6], [5; 5,5]; [5; 5,2]. Wys ook op die grafiek hoe jy dit bereken het. (Gebruik "Measure" en "Coordinates" om seker te maak dat jy die koördinate van die hellingsdriehoeke akkuraat genoeg plot.)
- 1.2 Wat was die bal se snelheid op die tydstip $t = 5$ (m.a.w. die oombliklike snelheid as $t = 5$)? Dui op die grafiek aan hoe jy dit bereken.

Voorbeeld 2 van aktiwiteit:

Staaft antwoorde met 'n voorbeeld(e) wat in Sketchpad geteken is.

1. Watter effek het die konstante r in die grafiek van die resiprook funksie:

$$f(x) = \frac{r}{x}?$$

2. Hoe beïnvloed die konstante h die grafiek van die resiprook funksie:

$$f(x) = \frac{1}{x-h}?$$

3. Hoe beïnvloed die konstante k die grafiek van die resiprook funksie:

$$f(x) = \frac{1}{x} + k?$$

4. Watter spesiale rol speel die punt $(h; k)$ in die grafiek van die resiprook funksie:

$$f(x) = \frac{1}{x-h} + k?$$

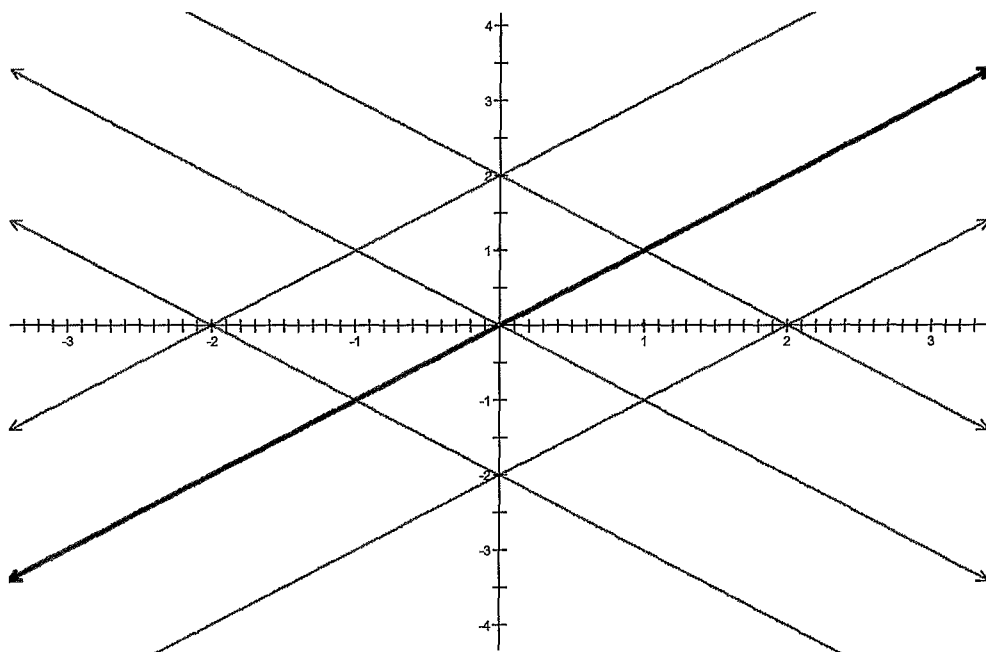
Voorbeeld 3 van aktiwiteit: Trigonometriese funksies

1. Maak 'n "rectangular grid" oop in GSP. Stel die x-as sodat 400 sigbaar is. Teken die volgende sketse en onthou om grade te gebruik.
2. Teken $\sin x$, $2\sin x$ en $4\sin x$ op dieselfde assestelsel.
3. Wat is die invloed van a in $y = a\sin x$?
4. Teken $\sin x$, $\sin 2x$ en $\sin 3x$ op dieselfde assestelsel.
5. Wat is die invloed van ω in $y = \sin \omega x$?
6. Teken $\sin x$, $\sin(x + 30^\circ)$ en $\sin(x + 45^\circ)$ op dieselfde assestelsel.
7. Wat is die invloed van c in $y = \sin(x + c)$?
8. Teken $\sin x$, $\sin x + 3$ en $-2 + \sin x$ op dieselfde assestelsel.
9. Wat is die invloed van d in $y = \sin x + d$?

Voorbeeld 4 van aktiwiteit

Rekonstrueer die volgende sketse d.m.v. GSP. Stel eers die asse soos op die sketse. Identifiseer die moederfunksie (in "BOLD"). Teken daarna ook die ander grafieke (beeldfunksies) m.b.v. transformasies. Skryf die vergelykings van die grafieke neer in die studie gids. Benoem ook die tipe translasië(s). Stoor elke skets op jou skyfie. Die sketse wat elke groep moet uitdruk sal in die klas aangewys word.

FIGUUR A



Moederfunksie:

Beeldfunksies:

.....

.....

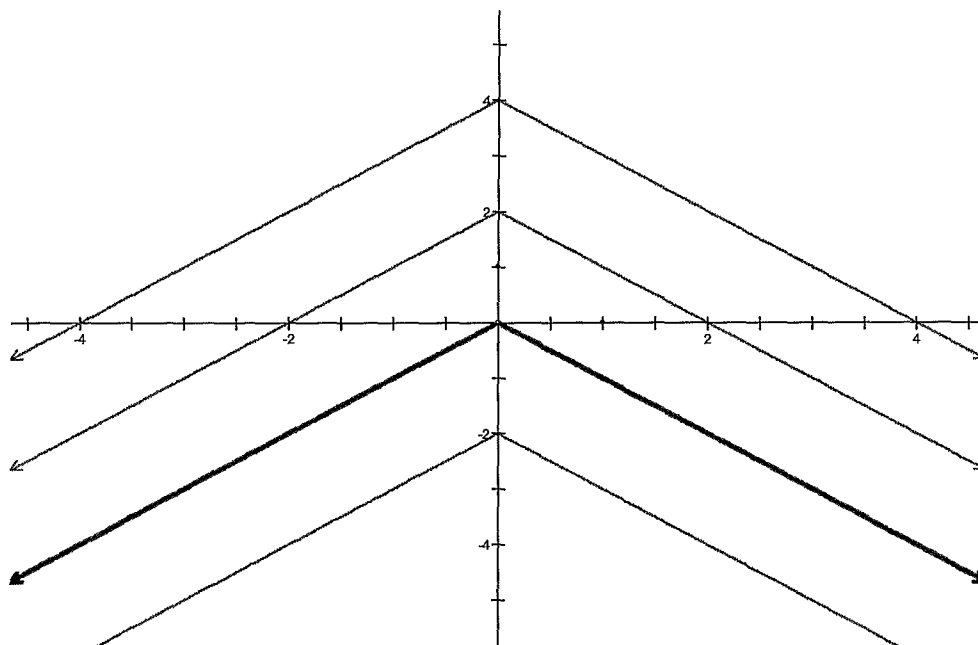
.....

.....

.....

Tipe translasie(s):

FIGUUR B



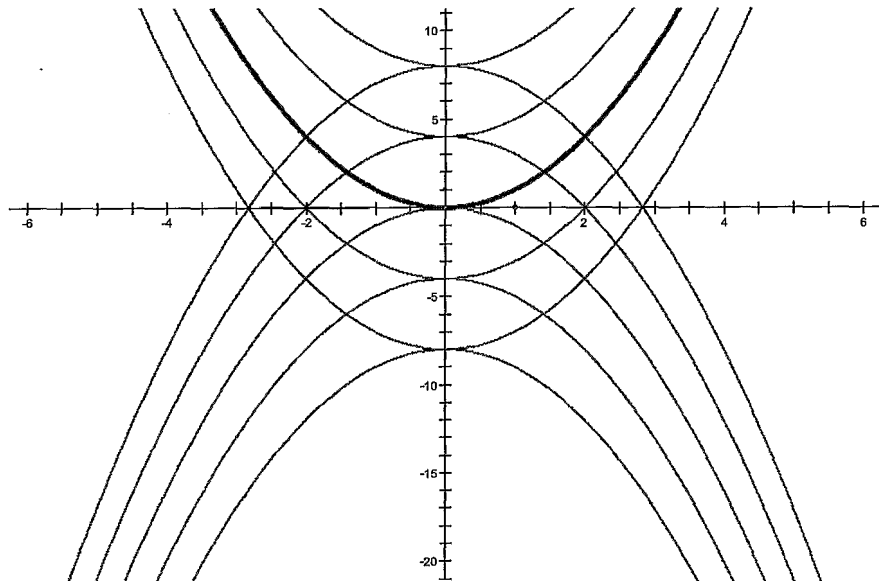
Moederfunksie:

Beeldfunksies:

.....
.....

Tipe translasie(s):

FIGUUR C



Moederfunksie:

Beeldfunksies:

.....
.....

Tipe translasie(s):

Voorbeeld 5 van aktiwiteit: Kombinasies van funksies

3. Die vertikale verplasing van 'n boei wat op die see dryf word beskryf deur

$$y = \cos 0,2t + 0,3\sin 0,4t$$

met y in meter en t in sekondes. Skets die eerste 40 sekondes van die grafiek met GSP. (Jy mag x i.p.v. t gebruik en werk in radiale)

- 3.1 Wat is die amplitude van die boei se beweging? (Wenk: Bereken dit met "measure coordinates")

- 3.2 Wat is die periode van die boei se beweging?