MTHT 400
Methods of Teaching Secondary Mathematics I
FALL 2005

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MODELING : grading scale and make-up
due: Oct. 26, 2005

1. The problems were graded with 3,3,4,3,1,3points respectively. The scores were 'bimodal'; 5 people got 17 and 5 got 11. More detailed explanation of some of the grading follows.
   (a) The key idea for the first problem is the assumption that the thickness of the water is the same for the entire region. One point was taken off for saying density instead of thickness.
   (b) There were two parts to problem 3; area and circumference. There were some very clever approaches to the circumference -doing a best fit line to the square root rather than power regression.
   (c) On problem 4, I gave only one point for quoting the VanderMonde determinant formula for doing the expansion. I had specifically said don't quote a result; prove this case. I wanted you to understand that the difference between doing this problem and high school work is the ability to work with variables.
   (d) Problem six is discussed below.
2. Scores of 13 or below may do the make-up.
3. Redo only the items you got wrong; attach the original paper.
4. For the make-up,
   (a) In problem 1, what are the units of the slope?
   (b) Discuss the role of the point $(0, 0)$ in approximating linear functions.
   (c) What is the difference between quantity x is proportional to quantity y and quantity x is is linear in quantity y.

(d) Find another example of an experiment that could be done in high school where this is a good explanation for a formula and then one could search for the parameters with a calculator.

What was this problem about? Calculators lie! The essence of curve fitting is to choose a particular form for the function that can be justified by data-free argument. The key to such an explanation is to give a physical meaning to each coefficient. Then one can use the calculator to estimate the values of the coefficients. Part 5 showed that any finite number of points can be approximated by a polynomial and so it is not impressive to get the calculator to fit a polynomial through a small amount of data.

A side point was to show that algebraic operations high school students do; (solve problem 3 with numerical coefficients) have profound methodological consequences.

Some students noticed that added benefits were to see how calculators can be used effectively in the classroom and to understand connections between various areas of mathematics.