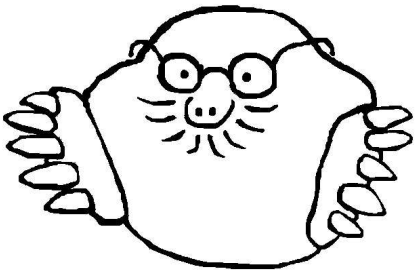

Math Mole

July 7, 2006 FRIDAY! Volume 4, No. 4

This issue

Quotes:

If only I had the theorems! Then I should find the proofs easily enough.

–Riemann

Nature laughs at the difficulties of integration.

–Pierre-Simon de Laplace

Puzzle1: If the numbers 2^n and 5^n (where n is a positive integer) have the same first digit, what is the digit? The numbers are written in decimal form, with no leading zeroes.

Puzzle2: Find the general solution of the following equation by hand. Do not use any calculators, computers, etc.

$\cos(15x) + \sin(7x) + \cos(11x) + \sin(9x) = 2\sin(8x)\cos(x)$

Mathematician of the Day

Georg Friedrich Bernhard Riemann, 1826-1866, Germany

- Riemann was a student under Gauss and was an assistant to Weber.
- He studied the theory of complex variables and examined geometric properties of analytic functions (Riemann surfaces).
- He gave the conditions of a function to have an integral, now called the condition of Riemann integrability.
- He formulated what is now known as the Riemann Hypothesis, an unsolved problem. It says that the function

$$\zeta(s) = 1 + \frac{1}{2^s} + \frac{1}{3^s} + \ldots = \sum_{n=1}^{\infty} \frac{1}{n^s}$$

  only has non-trivial complex zeros with real part equal to $1/2$.
- Sickly since birth, Riemann caught tuberculosis and soon died while still working on another hypothesis.

Today: A review of change of basis (6.5) and the begining of eigenvalues and eigenvectors (7.1)

Monday: Wrap-up eigenvalues and eigenvectors, parts of 7.2-7.4

Career Spotlight: Actuary

Significant Points: A strong background in mathematics is essential; actuaries must pass a series of examinations to gain full professional status. About 6 out of 10 actuaries are employed in the insurance industry. Employment opportunities should remain good for those who qualify, because the stringent qualifying examination system restricts the number of candidates.

Nature of the Work: One of the main functions of actuaries is to help businesses assess the risk of certain events occurring and to formulate policies that minimize the cost of that risk. For this reason, actuaries are essential to the insurance industry. Actuaries assemble and analyze data to estimate the probability and likely cost of the occurrence of an event such as death, sickness, injury, disability, or loss of property. Actuaries also address financial questions, including those involving the level of pension contributions required to produce a certain retirement income and the way in which a company should invest resources to maximize its return on investments in light of potential risk.

Work Environment: Actuaries have desk jobs, and their offices usually are comfortable and pleasant. They often work at least 40 hours a week. Some actuaries (particularly consulting actuaries) may travel to meet with clients. Consulting actuaries also may experience more erratic employment and be expected to work more than 40 hours per week.

Training, Other Qualifications, and Advancement: Actuaries need a strong background in mathematics. Applicants for beginning actuarial jobs usually have a bachelor's degree in mathematics, actuarial science, statistics, or a business-related discipline such as economics, finance, or accounting. Companies increasingly prefer well-rounded individuals who, in addition to having acquired a strong technical background, have some training in liberal arts and business and possess strong communication skills.

Earnings: Median annual earnings of actuaries were $76,340 in May 2004. The middle 50 percent earned between $54,770 and $107,650. According to the National Association of Colleges and Employers, annual starting salaries for graduates with a bachelor?s degree in actuarial science averaged $52,741 in 2005.

Job Outlook: Employment of actuaries is expected to grow faster than average for all occupations through 2014. Employment growth in the insurance industry is expected to continue at a stable pace, while more significant job growth is likely in some other industries. A significant proportion of new actuaries will find employment with consulting firms. Companies that may not find it cost effective to hire their own actuaries are increasingly hiring consulting actuaries to analyze various risks.