PROBLEMS AND SOLUTIONS

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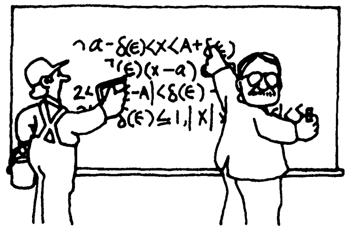

This section contains problems that challenge students and teachers of college mathematics. We urge you to participate actively in this section by submitting solutions and by proposing problems that are new and interesting. To promote variety, the editors welcome problem proposals that span the entire undergraduate curriculum.

Whenever possible, a proposed problem should be accompanied by a solution, appropriate references, and any other material that would be helpful to the editors. Each proposal or solution should be typed or printed neatly on separate sheets of paper, with your name and affiliation (if desired) on each page. Include a self-addressed, stamped envelope or postcard (preferred) if you want us to acknowledge the receipt of your contribution. Proposed problems and solutions may be mailed to the address provided above (preferred) or sent via e-mail (as English text or plain TeX) to beklein@davidson.edu. Solutions to the problems in this issue must be postmarked no later than August 15, 2000.

PROBLEMS

676. *Proposed by Rick Mabry, LSU–Shreveport, Shreveport, LA, and Paul Deiermann, Lindenwood University, St. Charles, MO*

Let $r(\theta) = 1 + b\cos(\theta)$, where $0 < b \leq 1$, describe a limaçon in polar coordinates. Determine the smallest rectangle of the form $[x_1, x_2] \times [y_1, y_2]$ that contains all these graphs. (This rectangle could be used as a fixed viewing window that contains the graphs of each of the limaçons.)

677. *Proposed by Geoffrey A. Kandall, Hamden, CT*

The function $f\colon(0,\infty) \to (-\infty,\infty)$ defined by $f(t) = \frac{\sinh(2t)}{2\sinh(t)} - \coth(t)$ is increasing and onto. Derive an explicit formula, that involves only algebraic functions and natural logarithms, for the inverse function f^{-1}.

678. *Proposed by David Atkinson, Olivet Nazarene University, Kankakee, IL*

For $n = 0, 1, \ldots,$ find the value of the double sum $\sum_{i=0}^{n} \sum_{j=0}^{n-i} \frac{(-1)^j}{i!j!}$ as a function of n.

679. *Proposed by Jerrold Grossman, Oakland University, Rochester, MI*

The new breakfast cereal, *Millenios*, consists of pieces in the two shapes 0 and 2. Thus, a spoonful of these pieces might contain a 2 and the three 0's needed to spell 2000. Suppose that a spoonful of n *Millenios* is obtained from a machine that