PROBLEMS

Problems, solutions, and any comments on the problems or solutions should be sent to Curtis Cooper, Department of Mathematics and Computer Science, Central Missouri State University, Warrensburg, MO 64093 (email: ccooper@cmsuvmb.cmsu.edu).

Problems which are new or interesting old problems which are not well–known may be submitted. They may range from challenging high school math problems to problems from advanced undergraduate or graduate mathematics courses. It is hoped that a wide variety of topics and difficulty levels will encourage a number of readers to actively participate in problems and solutions. An asterisk (*) after a number indicates a problem submitted without a solution.

Problems and solutions should be typed or neatly printed on separate sheets of paper. They should include the name of the contributor and the affiliation. Solutions to problems in this issue should be mailed no later than January 31, 1993, although solutions received after that date will also be considered until the time when a solution is published.

45. *Proposed by Mohammad K. Azarian, University of Evansville, Evansville, Indiana.*

Let α, β, and γ be the direction angles of a vector R. Without using Lagrange multipliers, show that

$$\cos\alpha + \cos\beta + \cos\gamma - 2\cos\alpha\cos\beta\cos\gamma \leq \sqrt{2} \ .$$

46. *Proposed by Robert E. Kennedy and Curtis Cooper, Central Missouri State University, Warrensburg, Missouri.*

What is the leading digit of 2^{googol}?

47. *Proposed by Russell Euler, Northwest Missouri State University, Maryville, Missouri.*

Find all the solutions of

$$(x-1)x(x+1)(x+2) = -1 \ .$$

48. *Proposed by Alvin Beltramo (student), Central Missouri State University, Warrensburg, Missouri.*

A standard deck of 52 cards is shuffled and then the cards are displayed, one at a time. Before each card is displayed, a person with a perfect memory guesses what each card is. How many cards can this person expect to guess correctly?