PROBLEM OF THE MONTH #2

SEPTEMER 2013

Directions: Write a complete solution to the problem below showing all work. Your paper must have your name, W#, and Southeastern email address. Solutions are to be placed in the envelope for Problem #2 located in the Department of Mathematics Office, Fayard 308 by 4:30 p.m., **Monday, September 30**. No late papers will be accepted.

All papers with a correct solution will be entered in a drawing for a great prize!

Questions concerning the problem of the month should be sent to either Dr. Tilak de Alwis (tdealwis@selu.edu), or Dr. Randy Wills (rwills@selu.edu)

Problem: *Irrational Behavior*

A rational number is a real number that can expressed as a quotient of two integers. A real number that is not rational is called an irrational number. For the purposes of this problem, you can assume that numbers such as $\sqrt{2}, \sqrt{3}, \pi, e,$ etc are irrational numbers.

1. Suppose that x and y are real numbers such that $x^2 + y^2$ *and* xy are rational numbers. Prove that $(x + y)^2$ is a rational number using the definition given above.

2. Can you find distinct irrational numbers x and y such that x^y is a rational number? Justify your answer.