# Mathematics 414, Problem Set #7
(due by 1:00, October 27)

Problem 1. Find an exact expression for the smallest positive real number x such that $\cos 3x + \sin 2x = 0$. Of course you may use any device to decide what the answer might be, but there should be a proof that your answer is correct. Formally, the question asks for the answer in radians, but you may prefer to work in degrees.

Problem 2. In the diagram, a square is divided into four triangles. The three outer triangles have equal area. What is the ratio of the area of the fourth (shaded) triangle to the combined area of the outer triangles?
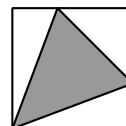
Problem 3. (a) A square is divided into 64 squares, of which at least 63 are 1×1. What can one say about the 64-th square? (b) What can one say about the 64-th square if a *rectangle* is split into 64 squares, of which at least 63 are 1×1?

Problem 4. Make up and solve a 6/7 or 8/10 workshop problem. Ideally it should be something that gets almost any student to *do* something (drawing, mathematical game, explicit listing).

Problem 5. Make up and solve an 8/10 or 11/12 workshop problem, getting inspiration from an explicitly identified *geometric* workshop problem from 2000 or before.

Assignment: Write out for yourself solutions to the 2009–2010 workshop problems, solutions that when necessary go beyond or improve on the solution sketches provided. This is necessary for effective handling of the problems during a workshop. And the midterm (scheduled for November 5) will be closely related to these workshop problems.