# DISCUSSION FOR SIXTH TUTORIAL

DATE: DECEMBER 5, 2011 OR JANUARY 9, 2012 : DUE IN TUTORIAL JANUARY 16 OR 23, 2012

The following problem is (roughly) from Thinking Mathematically Second Edition p. 221 (Archimedes' Regions).

The following two diagrams are made by putting circles of certain radii together. It is surprising to learn that for both of these diagrams the area contained inside the curves depends only on the height of the vertical line which has been drawn inside (the red line if you are looking at the pdf). Find and prove a formula for the area of the region bounded by the circles in terms of h, the length of the line.
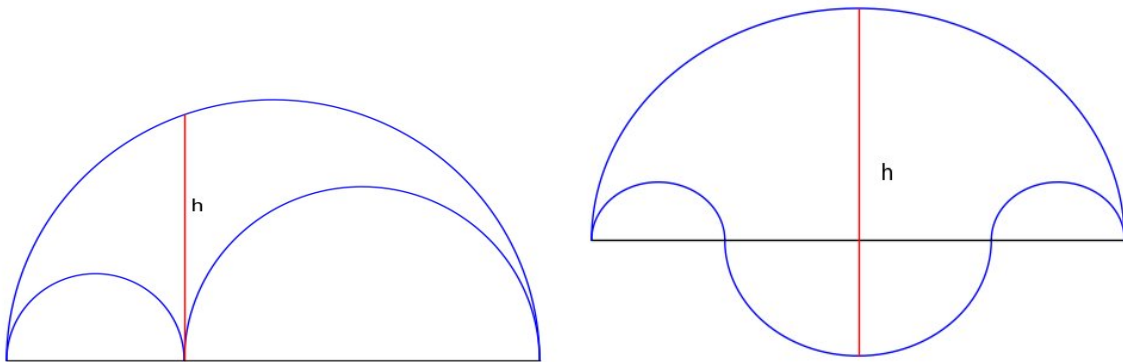
One way to generalize both these shapes is to consider the area enclosed by the following four semi-circles. For certain choices of semi-circles the two diagrams above are special cases. Find the information necessary to determine the area enclosed by these curves. Can you devise it so that the formula for the area of this shape reduces to the formula for the area of the shapes above?
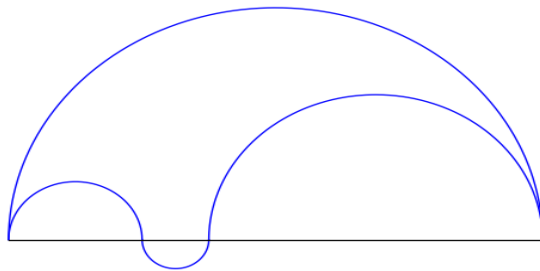
Can you generalize the result to other sorts of shapes drawn with semi-circles?