In Exercises 1–3, find the area of the shaded region. (Leave your answer in terms of $\pi$. Note that in Exercise 3, the center of each circle is a vertex of the regular hexagon.)

1. 

2. 

3. 

4. The diagram shows a region whose boundary consists of three congruent arcs of measure $270^\circ$ and three congruent line segments.
   a. If $r$ is the radius of one of the arcs, find the area of the region in terms of $r$.
   b. If the area of the region is $30 \text{ cm}^2$, what is $r$? Round to the nearest hundredth of a centimeter.

5. The diagram shows a rectangle inscribed in a circle, as well as 4 semicircles whose diameters are sides of the rectangle. Prove that the area of the shaded region is $ab$. (Hint: Use the Pythagorean theorem.)

6. In the diagram, all four shaded regions have the same area. If the smallest circle has radius 1, find the radii of the other three circles.

7. In the diagram, $\overline{ABE}$ is a semicircle with center $C$, and $\overline{ADB}$ is a semicircle with center $F$. If $AE = 12 \text{ in.}$, find the area of the shaded region.