1. Convert the given coordinates from polar to rectangular coordinates.

(a) $(3, \frac{\pi}{6})$ (b) $(2, \frac{3\pi}{2})$ (c) $(-1, \frac{\pi}{4})$ (d) $(0, \frac{\pi}{8})$

2. Convert the given coordinates from rectangular to polar coordinates.

(a) $(1, 0)$ (b) $(1, -\sqrt{3})$ (c) $(3, \sqrt{3})$ (d) $(-2, 2)$

3. Identify and/or describe each curve (given in polar coordinates).

(a) $r = 3\sec(\theta)$
(b) $r = \sqrt{18}\sec(\theta - \pi/4)$
(c) $r = 4$
(d) $r = 4\sin(\theta)$
(e) $r = \sin(\theta) + \cos(\theta)$
(f) $r = 5\sec(\theta + \pi/3)$

4. Graph the cardioid $r = 1 - \cos(\theta)$ and calculate the total area of the region enclosed by the curve.

5. Graph the rose $r = 2\cos(3\theta)$ and the circle $r = 1$. Find the area of the region that is inside both one petal of the rose and the circle.

6. Graph the cardioid $r = 1 + \cos(\theta)$ and the circle $r = 3\cos(\theta)$. Find the area of the region that is outside the cardioid, inside the circle, and above the x-axis.

7. Sketch a graph of the equation $r = 8\sin(4\theta)$ in the xy-plane. Then find the total area enclosed by the graph.

8. Sketch a graph of the equation $r = 2\cos(\theta) - 1$ in the xy-plane. (Observe that the graph consists of an inner loop and an outer loop.) Find the area enclosed by the inner loop and set up (but do not evaluate) an integral that gives the length of the inner loop.

9. Find the area inside the circle $r = 4$ and outside the circles $r = 8\sin(\theta)$ and $r = 8\cos(\theta)$.

10. Find the arc length of the parabola $r = \dfrac{\sqrt{2}}{1 + \cos(\theta)}$ from $\theta = 0$ to $\theta = \pi/2$.

11. Find the arc length of the entire cardioid $r = 2 - 2\sin(\theta)$.