Math 102 Spring 2008: **Solutions: HW #11**

Instructor: D. O'Donnol

1. section 9.2, #6

   Since $r^2 = x^2 + y^2$, we have $r^2 = 25$. So $r = \pm 5$, which are equations for the same sets. So $r = 5$.

2. section 9.2, #12

   Since $\tan\theta = \frac{y}{x}$, we have $\frac{y}{x} = \tan\theta = \tan\frac{3\pi}{4} = -1$. So $y = -x$.

3. section 9.2, #30

   Using $r^2 = x^2 + y^2$, $y = r\sin\theta$, and $x = r\cos\theta$ we see,

$$\begin{aligned} r &= 5\cos\theta + 5\sin\theta \\ r^2 &= 5r\cos\theta + 5r\sin\theta \\ x^2 + y^2 &= 5x + 5y \\ x^2 + y^2 - 5x - 5y &= 0 \\ x^2 + y^2 - 5x - 5y + (2.5)^2 + (2.5)^2 &= 2(2.5)^2 \\ (x - 2.5)^2 + (y - 2.5)^2 &= 2(2.5)^2 \end{aligned}$$

   So this is a circle with center $(2.5, 2.5)$ and radius $\sqrt{2}(2.5)$, shown in figure 9.2.21.

4. section 9.2, #34

   This is the cardioid in figure 9.2.28.

   itemsection 9.2, #35

   This is the limacon in figure 9.2.27.

5. section 9.2, #48

   Graph is shown in Figure 9.3.12 on page 678.

   This is symmetric about the y-axis.

6. section 9.3, #2

   This is area A_1 in Figure 9.3.19 on page 679, with intersection with the x-axis at $x = 0$ and $x = 2\pi$.

7. section 9.3, #8

   Find the area bounded by $r = 4\sin\theta$ that is the integral,

$$
\begin{aligned}
\int_0^\pi \frac{1}{2}(4\sin\theta)^2 d\theta &= \int_0^\pi 8\sin^2\theta d\theta \\
&= \left[4\theta - 2\sin 2\theta\right]_0^\pi \\
&= 4(\pi) - 2\sin 2\pi - (4(0) - 2\sin 2(0)) \\
&= 4\pi
\end{aligned}
$$