

Math 102 Spring 2008: Solutions: HW #11

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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.

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,

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