Math 1210 – Quiz #9 Fall 2011

Name: SOLUTIONS	A#:

1. Find the Cartesian coordinates of the points $(r, \theta) = (1, \frac{3\pi}{4})$ and $(r, \theta) = (-3, \frac{\pi}{6})$.

Use $x = r\cos\theta$ and $y = r\sin\theta$ to get

$$(r,\theta) = \left(1, \frac{3\pi}{4}\right) \Rightarrow (x,y) = \left(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$$

$$(r,\theta) = \left(-3, \pi/6\right) \Rightarrow (x,y) = \left(-\frac{3\sqrt{3}}{2}, -\frac{3}{2}\right)$$

2. Find the polar coordinates of the points $(x, y) = (1, -1)$ and $(3\sqrt{3}, 3)$.

Use $r = \sqrt{x^2+y^2}$ and $\theta = \tan^{-1}(y/x)$ to get

$$(x,y) = (1,-1) \Rightarrow (r,\theta) = (\sqrt{2}, -\pi/4)$$

$$(x,y) = (3\sqrt{3}, 3) \Rightarrow (r,\theta) = (6, \pi/6)$$

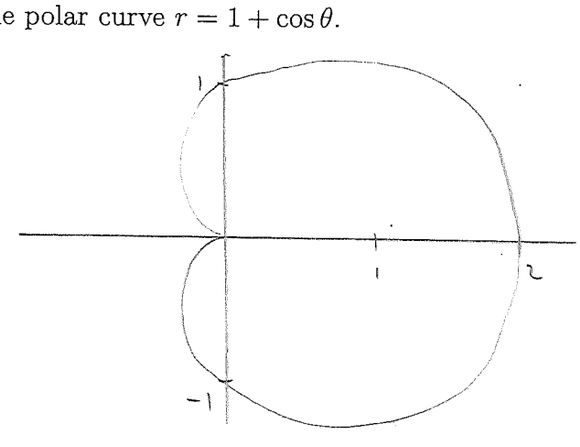
(Many other answers are possible!)

3. Find the Cartesian equation of the polar curve $r = 3\sin\theta$.

Since $y = r\sin\theta$, we have $r = 3\sin\theta \Rightarrow r = 3\left(\frac{y}{r}\right)$

$$\Rightarrow r^2 = 3y$$

But $r^2 = x^2+y^2$, so $\boxed{x^2+y^2 = 3y}$

Note: This is the same as $x^2 + (y - \frac{3}{2})^2 = \frac{9}{4}$, so we recognize the curve to be a circle of radius $3/2$ centered at $(x,y) = (0, 3/2)$

4. Sketch the polar curve $r = 1 + \cos\theta$.