

## Polar Coordinates Worksheet

1) Find all representations for the polar points

a)  $(2, \pi/6)$                       b)  $(2, \pi/3)$  with  $r < 0$  and  $0 \leq \theta < 2\pi$ .

2) Transform exactly the following points from Cartesian to polar

a)  $(-5, 0)$                       b)  $(2\sqrt{2}, -2)$                       c)  $(-3, 3\sqrt{3})$

3) Transform to polar coordinates the following Cartesian curves

a)  $x^2 + y^2 = 2$                       b)  $2x - 6y = 3$                       c)  $y = -\sqrt{3}x$

4) Transform the following polar curves to Cartesian Coordinates

a)  $r = \frac{1}{2 - \cos(\theta)}$                       b)  $r = \frac{1}{1 - \sin(\theta)}$                       c)  $r = \csc^2\left(\frac{\theta}{2}\right)$

5) Sketch  $r = \frac{1}{1 - \sin(\theta)}$  by transforming to rectangular coordinates. Label the intercepts. Check with your grapher.

6) Identify the following curves:

a)  $r = 2\cos(5\theta)$                       b)  $r = -2 - 2\sin(\theta)$                       c)  $r = \frac{1}{2\cos(\theta) + 3\sin(\theta)}$

d)  $\cos(\theta) = 2\sin(\theta)$                       e)  $r = 2\sec(\theta)$                       f)  $r = -2 + 3\cos(\theta)$

7) Find the equation of the tangent line to  $r = 2\cos(\theta)$  at  $\theta = \pi/6$ .

8) Find the Arc Length of the following polar curves

a)  $r = \sin^2\left(\frac{\theta}{2}\right)$   $0 \leq \theta \leq \pi$

b) the cardioid  $r = 1 - \cos(\theta)$   $0 \leq \theta \leq 2\pi$ , by using half angle formulas .

9) Find the area:

a) inside the cardioid  $r = 4 + 4\cos(\theta)$  and outside the circle  $r = 6$ .

b) of the region common to the curves  $r = \cos(\theta)$  and  $r = \sin(\theta)$ .