

SECTION 7.3: POLAR COORDINATES (DAY 2)

(1) The points below are in polar coordinates. Convert them to rectangular coordinates.

(a)  $(5, 5\pi/3)$

$$x = r \cos \theta = 5 \cos(5\pi/3) = 5 \cdot \frac{1}{2} = 5/2$$

$$\left(\frac{5}{2}, -\frac{5\sqrt{3}}{2}\right)$$

$$y = r \sin \theta = 5 \sin\left(\frac{5\pi}{3}\right) = 5\left(-\frac{\sqrt{3}}{2}\right) = -5\sqrt{3}/2$$

(b)  $(-0.5, -5\pi/6) = \left(\frac{1}{2}, \frac{\pi}{6}\right)$

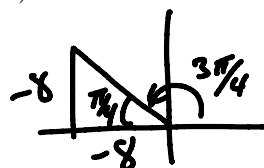
$$\left(\frac{\sqrt{3}}{4}, \frac{1}{4}\right)$$

$$x = \frac{1}{2} \cos\left(\frac{\pi}{6}\right) = \frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$$

$$y = \frac{1}{2} \sin\left(\frac{\pi}{6}\right) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

(2) The points below are in rectangular coordinates. Convert them to polar coordinates.

(a)  $(-8, 8)$



$$r = \sqrt{8^2 + 8^2} = 8\sqrt{2}$$

$$(8\sqrt{2}, 3\pi/4)$$

(b)  $(2\sqrt{3}, 2) = \left(4\left(\frac{\sqrt{3}}{2}\right), 4\left(\frac{1}{2}\right)\right)$

$$\left(2, \frac{\pi}{6}\right)$$



$$\theta = \pi/6$$

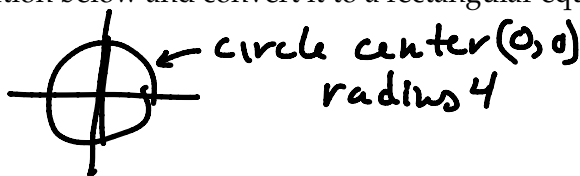
$$r = \sqrt{4 \cdot 3 + 4} = 2$$

(3) Describe the graph of each polar equation below and convert it to a rectangular equation.

(a)  $r = 4$

$$r^2 = 16$$

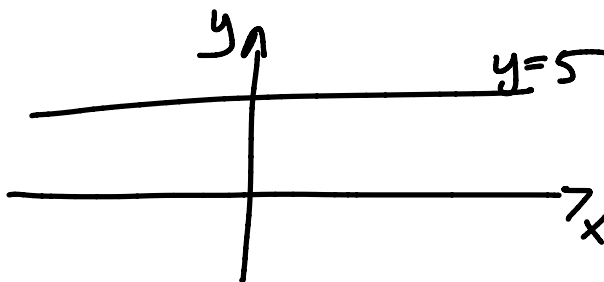
$$x^2 + y^2 = 16$$



(b)  $r = 5 \csc(\theta) = \frac{5}{\sin \theta}$

$$r \sin \theta = 5$$

$$y = 5$$



(4) Convert the equations below from rectangular equations to polar equations.

(a)  $x^2 + y^2 = 20$

$$r^2 = 20$$

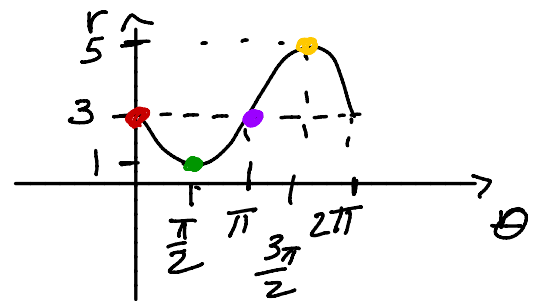
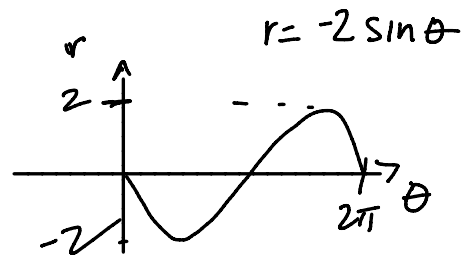
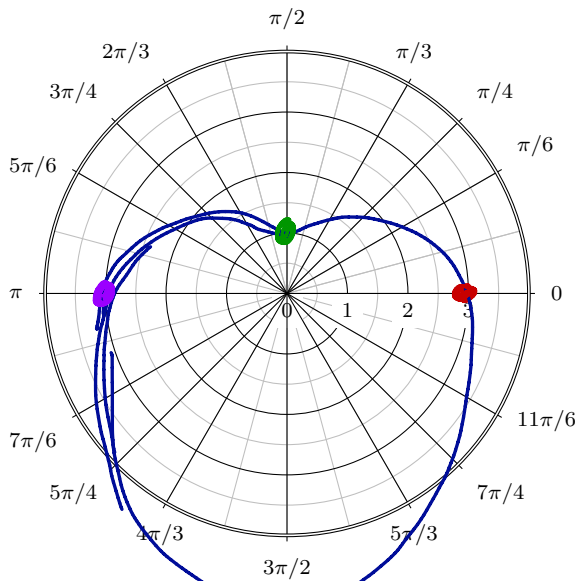
(b)  $y = 5x^2$        $r \sin \theta = 5 r^2 \cos^2 \theta$

or  $\sin \theta = 5 r \cos^2 \theta$

or  $r = \frac{1}{5} \tan \theta$

(5) Sketch the graph of the polar equations below.

(a)  $r = 3 - 2 \sin(\theta)$



(b)  $r = 2 \cos(3\theta)$

