Review Exercise Set 16

Exercise 1: Plot the point (-3, 30°) using a polar coordinate system.

Exercise 2: Find another representation (r, θ) of the point $\left(2, \frac{\pi}{3}\right)$ that satisfies the given conditions.

$r > 0$ and $2\pi < \theta < 4\pi$

Exercise 3: Find the polar coordinates for the given rectangular point.

(-8, -5)

Exercise 4: Convert the given rectangular equation into a polar equation that expresses r in terms of θ.

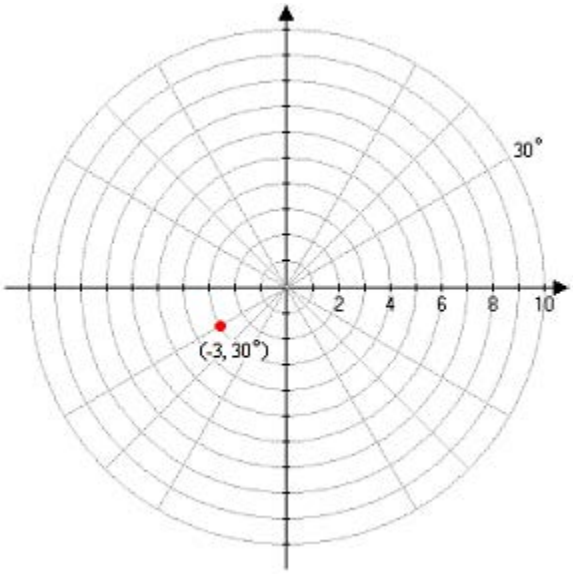
$$(x - 2)^2 + (y + 1)^2 = 9$$

Exercise 5: Convert the given polar equation to a rectangular equation.

$$r = \frac{8}{\cos\theta + 4\sin\theta}$$

Review Exercise Set 16 Answer Key

Exercise 1: Plot the point (-3, 30°) using a polar coordinate system.



Exercise 2: Find another representation (r, θ) of the point $\left(2, \frac{\pi}{3}\right)$ that satisfies the given conditions.

$r > 0$ and $2\pi < \theta < 4\pi$

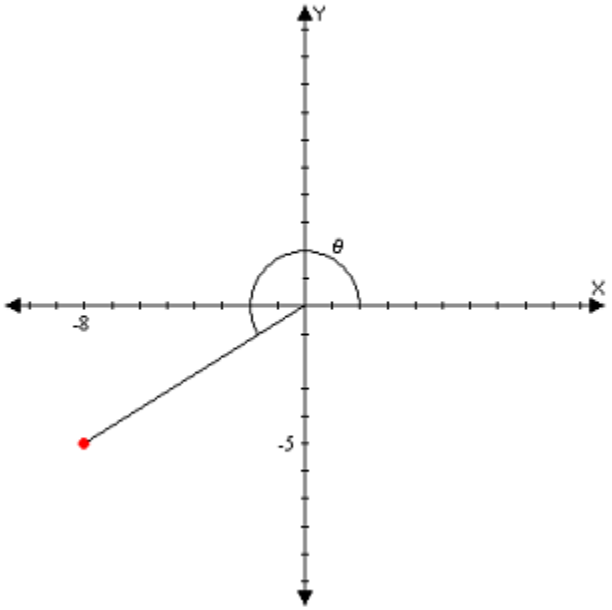
Since r is already positive we will not change it and will only add 2π to the angle measurement.

$$\left(2, \frac{\pi}{3}\right) = \left(2, \frac{\pi}{3} + 2\pi\right)$$
$$= \left(2, \frac{7\pi}{3}\right)$$

Exercise 3: Find the polar coordinates for the given rectangular point.

(-8, -5)

Plot the point



Find r

$$r^2 = x^2 + y^2$$
$$r^2 = (-8)^2 + (-5)^2$$
$$= 64 + 25$$
$$= 89$$
$$r \approx 9.4$$

Find θ

$$\tan\theta = \frac{y}{x}$$
$$= \frac{-5}{-8}$$
$$= 0.625$$
$$\theta \approx 32°$$

Θ must be in quadrant III so we would add 180° to the reference angle of 32°

$$\theta \approx 32° + 180°$$
$$\approx 212°$$

The polar coordinates of the point (-8, -5) is (9.4, 212°)

Exercise 4: Convert the given rectangular equation into a polar equation that expresses r in terms of θ.

$(x - 2)^2 + (y + 1)^2 = 9$

Replace x and y with their polar equivalents

$x = r \cos \theta$
$y = r \sin \theta$

$(x - 2)^2 + (y + 1)^2 = 9$
$(r \cos \theta - 2)^2 + (r \sin \theta + 1)^2 = 9$

Simplify

$r^2 \cos^2 \theta - 4r \cos \theta + 4 + r^2 \sin^2 \theta + 2r \sin \theta + 1 = 9$
$r^2 \cos^2 \theta + r^2 \sin^2 \theta - 4r \cos \theta + 2r \sin \theta + 1 + 4 = 9$
$r^2 (\cos^2 \theta + \sin^2 \theta) - 4r \cos \theta + 2r \sin \theta + 5 = 9$
$r^2 (1) - 4r \cos \theta + 2r \sin \theta = 4$
$r^2 - 4r \cos \theta + 2r \sin \theta = 4$

Exercise 5: Convert the given polar equation to a rectangular equation.

$$r = \frac{8}{\cos\theta + 4\sin\theta}$$

Rewrite the equation to get cos and sin together with r

$$r(\cos\theta + 4\sin\theta) = \frac{8}{\cos\theta + 4\sin\theta}(\cos\theta + 4\sin\theta)$$
$$r\cos\theta + 4r\sin\theta = 8$$

Substitute in the rectangular equivalents

$x + 4y = 8$