

**Exercise 159**

For the following exercises, solve the trigonometric equations on the interval  $0 \leq \theta < 2\pi$ .

$$\sqrt{3} \cot \theta + 1 = 0$$

**Solution**

$$\sqrt{3} \cot \theta + 1 = 0$$

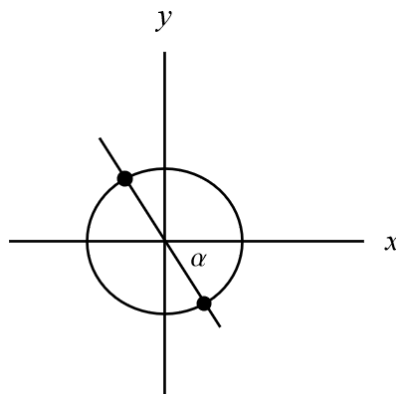
$$\sqrt{3} \cot \theta = -1$$

$$\cot \theta = -\frac{1}{\sqrt{3}}$$

$$\frac{1}{\tan \theta} = -\frac{1}{\sqrt{3}}$$

$$\tan \theta = -\sqrt{3}$$

The tangent of an angle is negative in quadrants II and IV.



Taking the inverse tangent of  $-\sqrt{3}$  gives  $-60^\circ$ , or  $-\pi/3$  radians. This is  $\alpha$  in the figure.

$$\alpha = -\frac{\pi}{3}$$

To obtain the angle to the point in the second quadrant, add  $\pi$  to  $\alpha$ .

$$\pi + \alpha = \frac{2\pi}{3}$$

Since every angle has to be between 0 and  $2\pi$ , use  $\alpha + 2\pi = 5\pi/3$  rather than  $\alpha$ . Therefore,

$$\theta = \left\{ \frac{2\pi}{3}, \frac{5\pi}{3} \right\}.$$