

9-1 Study Guide and Intervention

Polar Coordinates

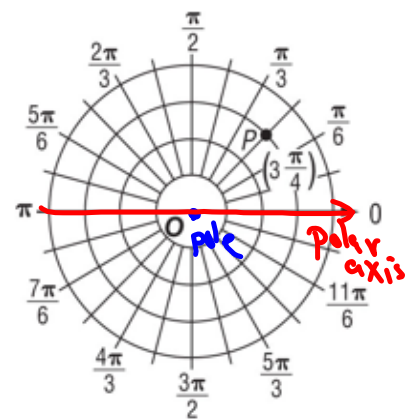
Graph Polar Coordinates A polar coordinate system uses distances and angles to record the position of a point. The location of a point P can be identified by polar coordinates of the form (r, θ) , where r is the directed distance from the pole, or origin, to point P and θ is the measure of the directed angle formed by the ray from the pole to point P and the polar axis.

Example: Graph each point.

a. $P\left(3, \frac{\pi}{4}\right)$

Sketch the terminal side of an angle measuring $\frac{\pi}{4}$ radians in standard position.

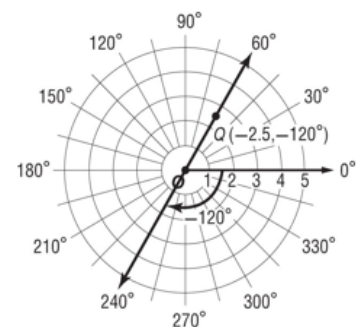
Since r is positive ($r = 3$), find the point on the terminal side of the angle that is 3 units from the pole. Notice point P is on the third circle from the pole.



b. $Q(-2.5, -120^\circ)$

Negative angles are measured clockwise. Sketch the terminal side of an angle of -120° in standard position.

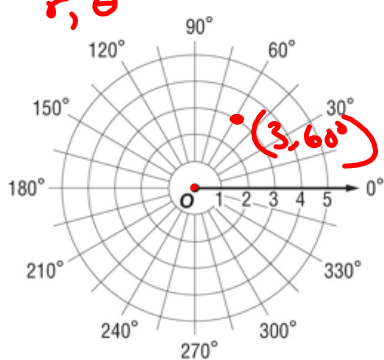
Since r is negative, extend the terminal side of the angle in the opposite direction. Find the point Q that is 2.5 units from the pole along this extended ray.



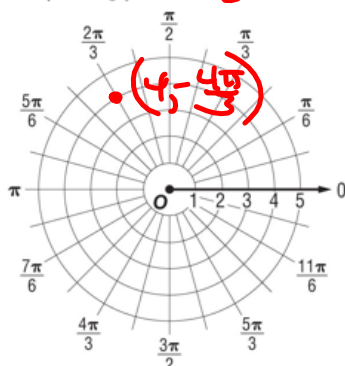
Exercises

Graph each point on a polar grid.

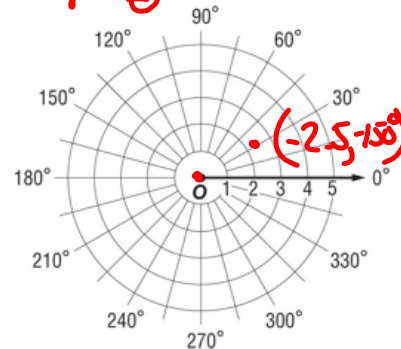
1. $R(3, 60^\circ)$

 r, θ 

2. $Q\left(4, -\frac{4\pi}{3}\right)$ $-\frac{4\pi}{3} = -1\frac{1}{3}\pi$



3. $A(-2.5, -150^\circ)$

 r, θ 

Give 3 different polar points for each point.

$$\begin{aligned}
 3. \quad A(-2.5, -150^\circ) \\
 &= (2.5, 30^\circ) \\
 &= (-2.5, 210^\circ) \\
 &= (2.5, -330^\circ)
 \end{aligned}$$

9-1 Study Guide and Intervention *(continued)*

Polar Coordinates

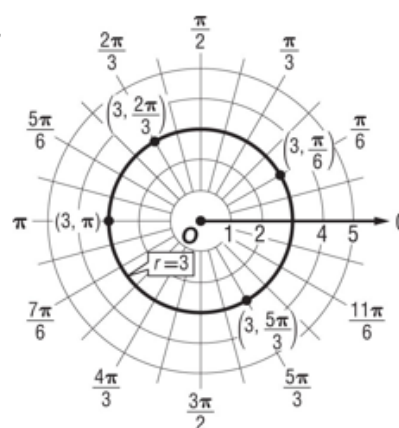
Graphs of Polar Equations An equation expressed in terms of **polar coordinates** is called a polar equation. A polar graph is the set of all points with coordinates (r, θ) that satisfy a given polar equation. The graphs of polar equations like $r = k$ and $\theta = k$, where k is a constant, are considered basic in the polar coordinate system. The solutions of $r = k$ are ordered pairs of the form (k, θ) where θ is any real number. The solutions of $\theta = k$ are ordered pairs of the form (r, θ) where r is any real number.

Example: Graph each polar equation.

a. $r = 3$

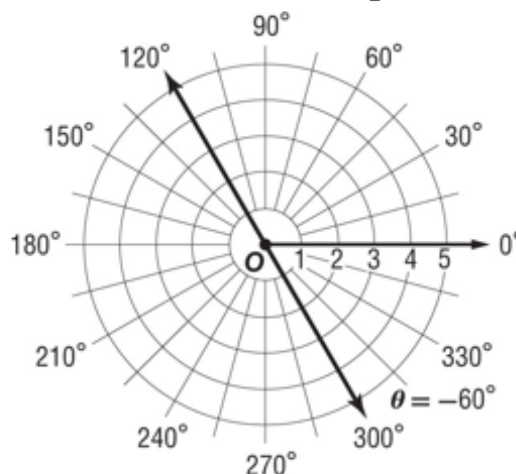
The solutions of $r = 3$ are ordered pairs of the form $(3, \theta)$, where θ is any real number.

The graph consists of all the points that are 3 units from the pole, so the graph is a circle centered at the origin with radius 3.



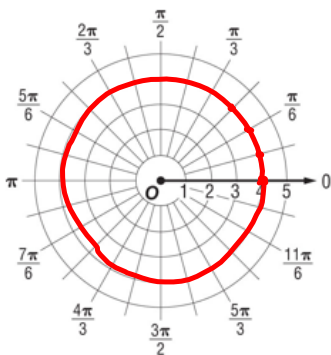
b. $\theta = -60^\circ$

The solutions of $\theta = -60^\circ$ are ordered pairs of the form $(r, -60^\circ)$, where r is any real number. The graph consists of all the points on the line that make an angle of -60° with the positive polar axis.

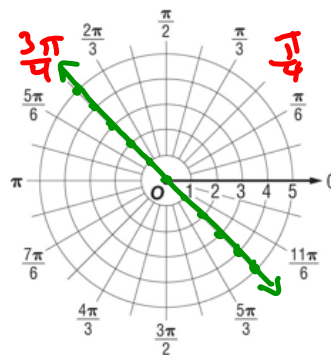


Graph each polar equation.

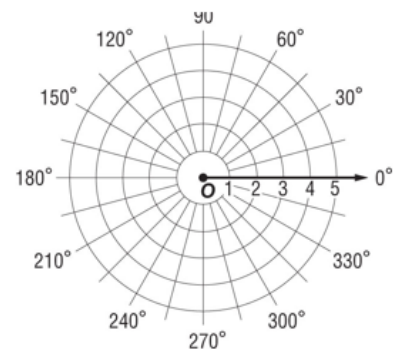
1. $r = 4$



2. $\theta = \frac{3\pi}{4}$



3. $\theta = -300^\circ$



HW: p. 538
1, 3, 5, 13, 15, 19, 23, 25, 27

