9-1

Study Guide

Polar Coordinates

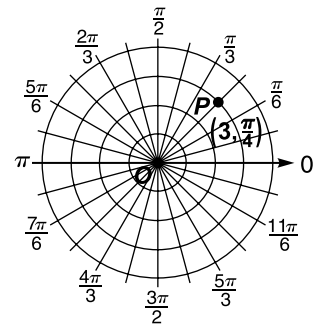
A **polar coordinate system** uses distances and angles to record the position of a point. The location of a point P can be identified by polar coordinates in the form (r, θ), where $|r|$ is the distance from the **pole**, or origin, to point P and θ is the measure of the angle formed by the ray from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

Example 1 **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.

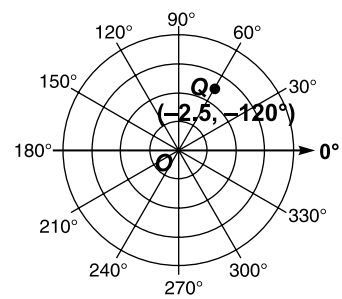
Since r is positive ($r = 3$), find the point on the terminal side of the angle that is 3 units from the pole. *Notice point P is on the third circle from the pole.*



b. $Q(-2.5, -120°)$

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.



Example 2 **Find the distance between $P_1(3, 70°)$ and $P_2(5, 120°)$.**

$$P_1P_2 = \sqrt{r_1^2 + r_2^2 - 2r_1r_2\cos(\theta_2 - \theta_1)}$$
$$= \sqrt{3^2 + 5^2 - 2(3)(5)\cos(120° - 70°)}$$
$$\approx 3.84$$