Polar Coordinates
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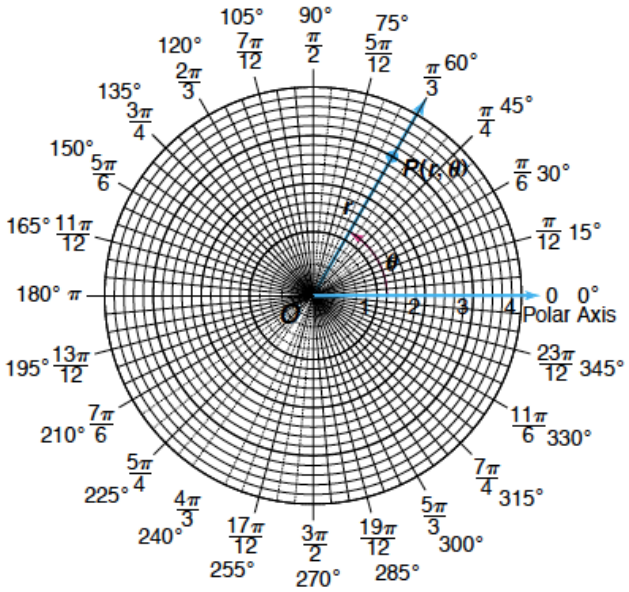
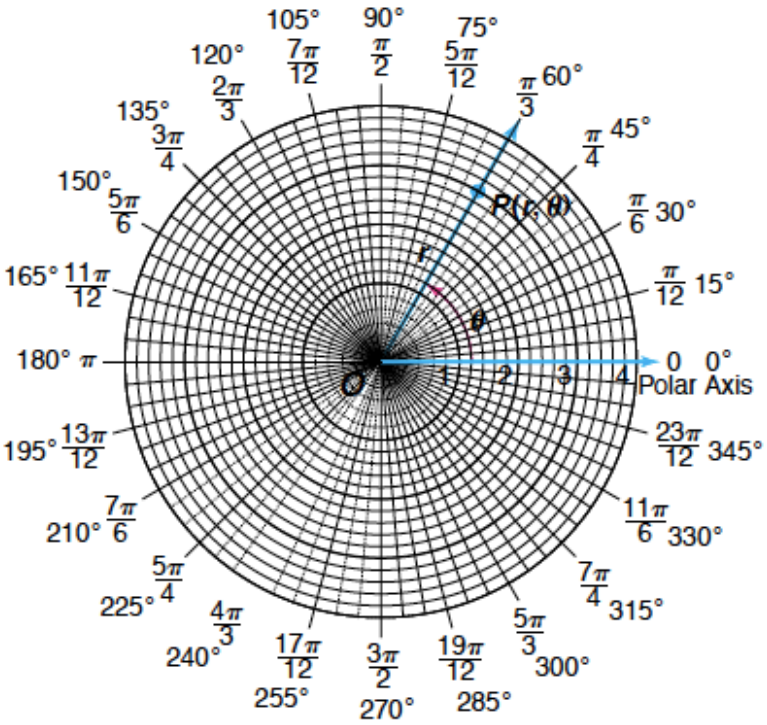
Recording the position of an object using a distance from a fixed point and at an angle made with a fixed ray uses a polar coordinate system.



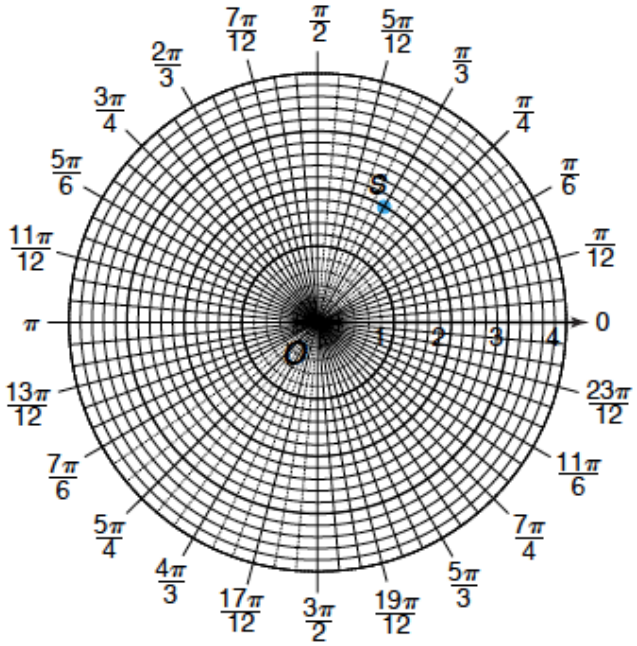
The origin is called the ***pole***.
The polar axis is usually a horizontal ray directed toward the right side of the pole.

A point on the polar coordinate consists of the radius and angle.
$P(r, \theta)$

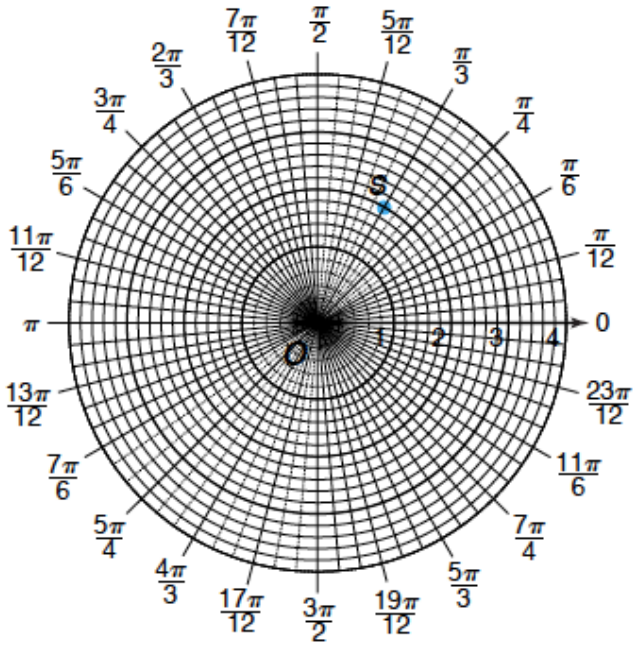
Graph the point. P(3,60°)



Graph the point S$(-2, \frac{4\pi}{3})$



P(-2,−120°)

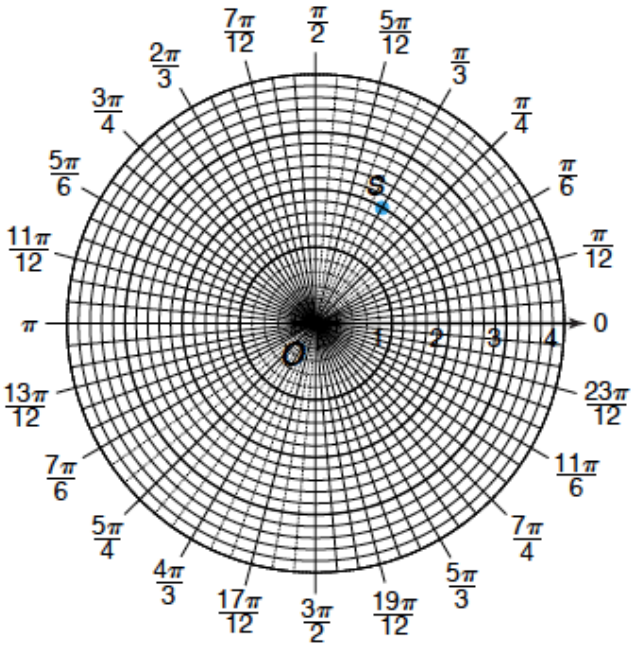


Multiple Representations of (r, θ)	If a point P has polar coordinates (r, θ), then P can also be represented by polar coordinates $(r, \theta + 2\pi k)$ or $(-r, \theta + (2k + 1)\pi)$, where k is any integer.

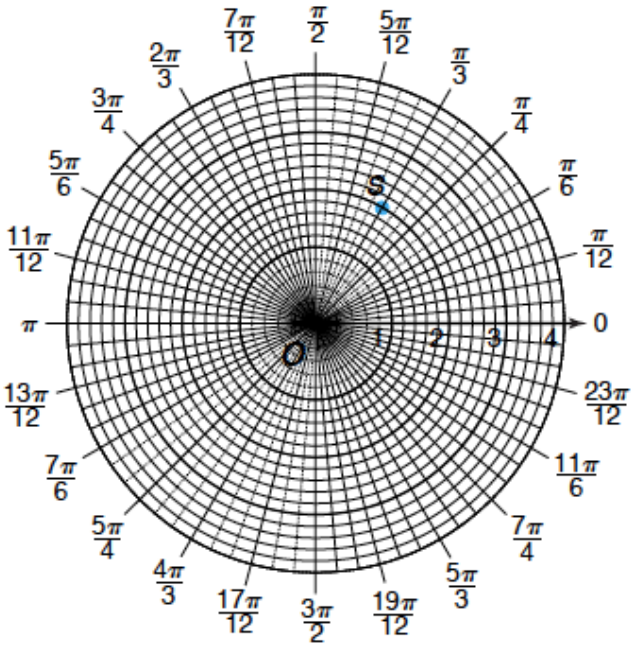
An equation expressed in terms of polar coordinates is called a **polar equation.** For example, $r = 2 \sin \theta$ is a polar equation. A **polar graph** is the set of all points whose coordinates (r, θ) satisfy a given polar equation.

Graph the equation

$r = 3$



Graph $\theta = \frac{5\pi}{3}$



Distance Formula in Polar Plane	If $P_1(r_1, \theta_1)$ and $P_2(r_2, \theta_2)$ are two points in the polar plane, then $P_1P_2 = \sqrt{r_1^2 + r_2^2 - 2r_1r_2 \cos(\theta_2 - \theta_1)}$.

I do.

Find the distance between the two given polar points.

$P_1(3,60°), P_2(10,20°)$

Plug into equation	
Simplify	

You do:

Find the distance between the two given polar points.

$P_1(9,60°), P_2(8,20°)$

Exit ticket:

1) Find the distance between the two given polar points.

$P_1(2,110°), P_2(4,30°)$

2) Graph the equation

$r = 4$

3) Graph the point. P(3,60°)