BC 3 Name:________________________________

A SECOND VIEW OF POLAR COORDINATES

We've seen polar coordinates previously, and it's now time to take another look. We begin with a quick review of the basic set-up. Later, we'll extend the earlier work to look at the calculus of polar graphs.

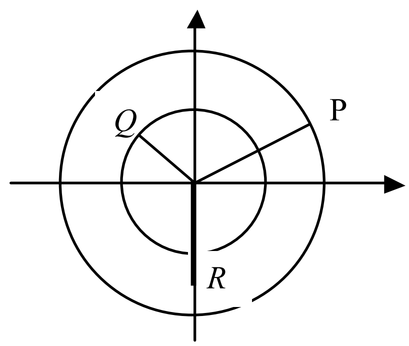
We begin with point O, the pole, and a polar axis.

We label a point $P\ (r,\ \theta)$ where r is the distance from the pole and θ is the angle formed between the positive x-axis and the ray that extends to the point.

Ex: $P(2, 30°)$

$Q(1, 3\pi/4)$

$R(1.5, -\pi/2)$



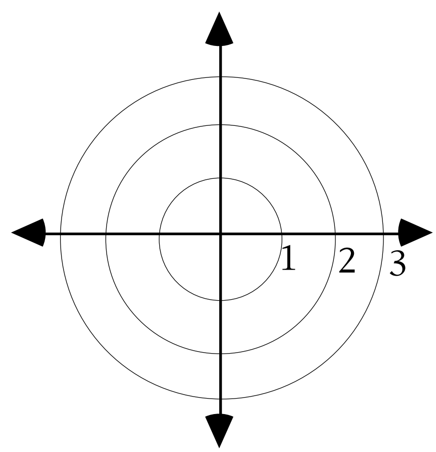
(1) To plot points, it is often easiest to find the ray determined by the angle and then go out a distance r from the pole, even though the coordinates are not given in this order.

Plot and label the following points:

$A(2,\ \pi/6)$ $B(1,\ 3\pi/4)$

$C(3,\ -\pi/2)$ $D(-3,\ \pi/4)$

$E(2,\ -\pi/3)$ $F(2,\ 5\pi/3)$



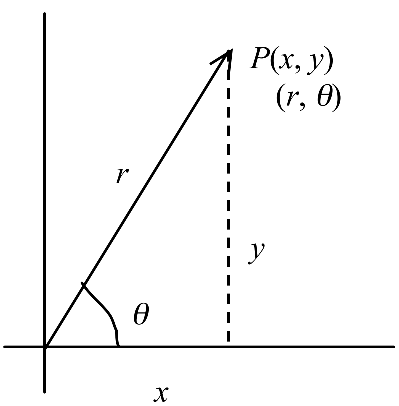
(2) Explain how to plot a point if r is negative.

(3) What is significant about points E and F? Can this happen with rectangular (x-y) coordinates?

(4) Find three alternative coordinate pairs for the following point:

(3, $7\pi/6$) or (,) or (,) or (,)

(5) We need to examine the relationship between the ordered pairs (x, y) and (r, θ), which are usually distinguished by context.



Complete, according to the picture:

$\cos\theta =$ so $x =$

$\sin\theta =$ so $y =$

Also, in terms of x and y,

$r^2 =$

and $\tan\theta =$

(6) Change the following from polar to rectangular, finding exact values if possible.
$(6, 2\pi/3)$ $(-2, \pi/4)$ $(4, 212°)$

(7) Change the following from rectangular to polar form. (A quick sketch may be helpful in finding the angle.)
$(3, -3)$ $(-2, -2\sqrt{3})$ $(-3, 5)$