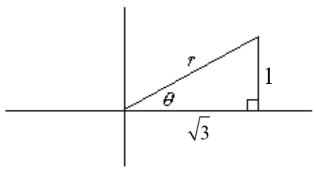
Name: ______________________ **Precalculus Unit 10, Lesson 9**

Aim: What is the polar coordinate system?

I. Do Now:

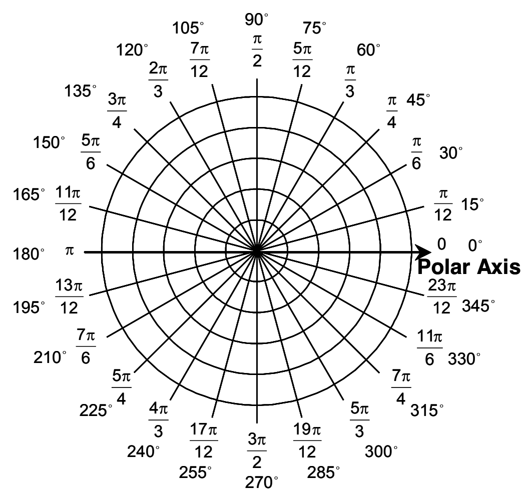
1. Find the value of r and $m\angle\theta$.



2. Convert $\frac{3\pi}{4}$ to degrees.

3. Evaluate:
$\sin\frac{3\pi}{4}$
$\cos\frac{3\pi}{4}$
$\tan\frac{3\pi}{4}$

II. Thus far, we have been using the *rectangular coordinate system* (also known as the *Cartesian coordinate system*, after the mathematician René Descartes). Now, we will learn the *polar coordinate system*, which has various applications, including circular and orbital motion, navigation, and radio antennas.

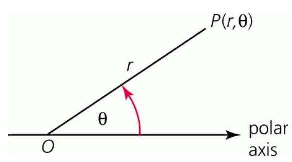


Polar Coordinate System:

A fixed point O is called the *pole* or origin.

The *polar axis* is usually a horizontal ray pointing to the right of the pole.

A point P can be identified by the polar coordinates (r, θ), where:



- r is the directed distance from O to P.
- θ is the directed angle whose initial side is on the polar axis and whose terminal side is on the line OP.

III. Plotting Points in the Polar Coordinate System

4. Plot the following points on the graph below:

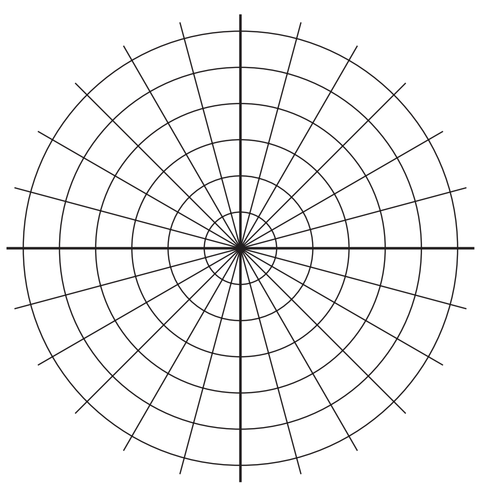
$A\left(3, \frac{\pi}{4}\right)$

$B\left(2, \frac{\pi}{3}\right)$

$C\left(3, -\frac{\pi}{6}\right)$

$D\left(3, \frac{11\pi}{6}\right)$

$E\left(-2, \frac{4\pi}{3}\right)$



5. Plot the following points on the graph below:

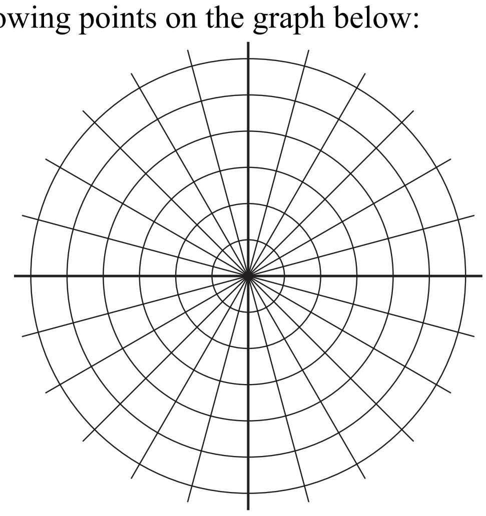
$F\left(4, 60^\circ\right)$

$G\left(-4, 240^\circ\right)$

$H\left(3, \frac{2\pi}{3}\right)$

$I\left(-3, \frac{5\pi}{3}\right)$

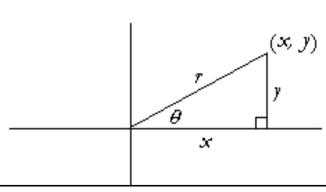
$J\left(-2, \frac{4\pi}{3}\right)$



Observations:

IV. Converting from Polar Coordinates to Rectangular Coordinates

Given the triangle below, find: (a) $\cos\theta$ (b) $\sin\theta$



V. Examples: Find the exact rectangular coordinates of each point:

6. $\left(3, 270^\circ\right)$ 7. $\left(-2, -\frac{5\pi}{6}\right)$ 8. $\left(-6, 120^\circ\right)$ 9. $\left(-4, \frac{5\pi}{4}\right)$

HW34
- Read pages 800 - 801.
- p. 805: 1, 2, 5, 6 (use polar graph paper for # 5 and #6)
- p. 451: 9, 13 • p. 456: 49 • p. 458: 20