9.1 Polar Coordinates

Objectives:

- Graph points in polar coordinates.
- Graph simple polar equations.
- Determine the distance between two points with polar coordinates.

POLAR FORM:
Theorem: For any particular values of r and θ, the following polar coordinate representations name the same point. **a.** $[r,\theta]$ **b.** $[r,\theta+2\pi n]$, for all integers *n* **c.** $[-r,\theta+(2n+1)\pi]$ for all integers *n*

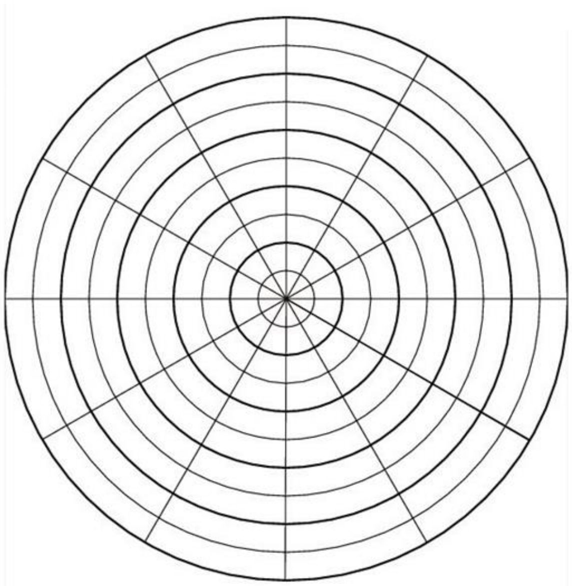
Example 1:
Graph each of the following polar coordinates on the grid below. Label each point!

a. A = [3, 60º]

b. B = $\left[-1.5, \frac{7\pi}{6}\right]$

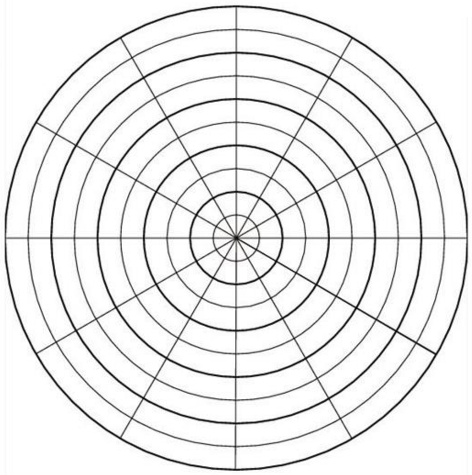
c. C = [-2, -135º]

d. D = [5, -90º]



Example 2:

Name 3 other polar coordinates that will represent the point [3, 150^o] with the restriction that $-360^o \le \theta \le 360^o$.

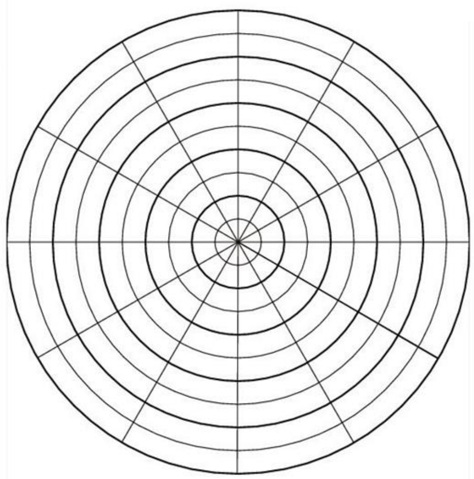


Example 3:

Graph each polar equation:

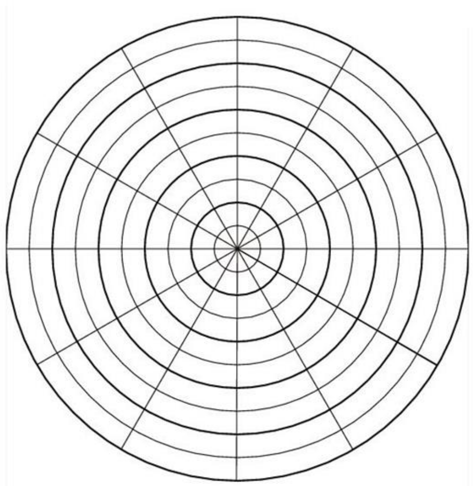
a. $r = 3$

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



Example 4:

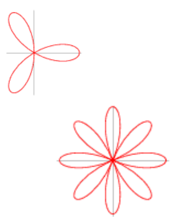
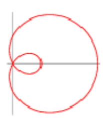
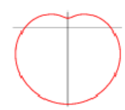
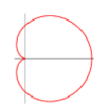
While mapping out a level site, a surveyor identifies a landmark 450 feet away and 30^o to the left and another landmark 600 feet away and 50^o to the right. What is the distance between the two landmarks?



9.2 Graphs of Polar Equation

Objectives:

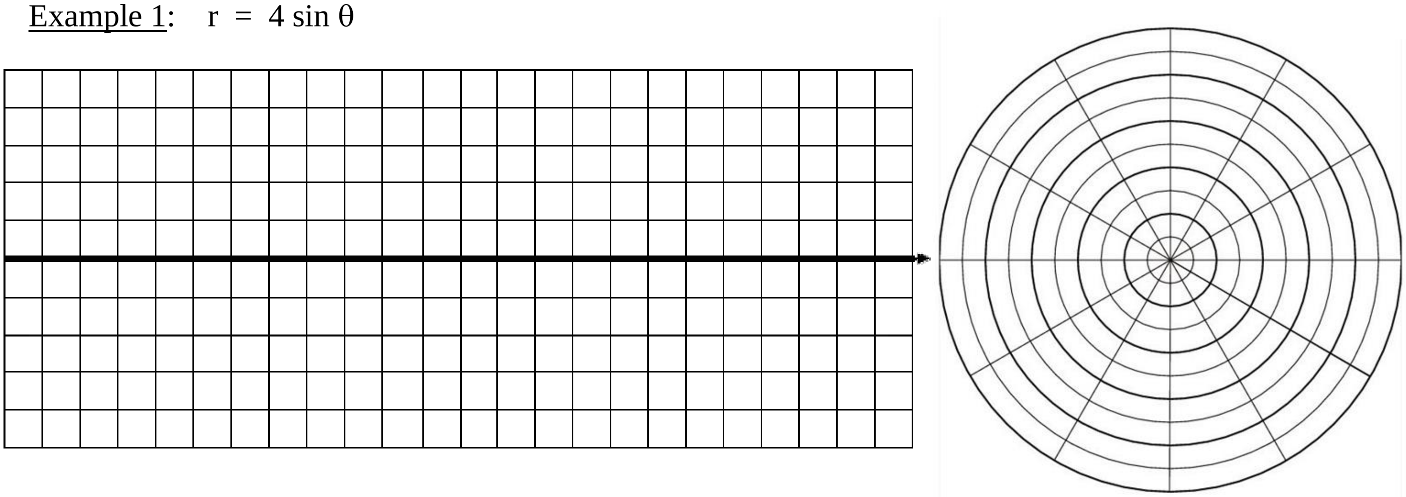
- Graph Polar Equations
- Identify the different types of Polar Graphs from their equations

Curve	**Rose**	**Limacon with a loop**	**Limacon with a dimple**	**Cardioid**
Polar Equation	$r = a\cos(n\theta)$ $r = a\sin(n\theta)$ *n is a pos. Int.	$r = a + b\cos\theta$ $r = a + b\sin\theta$ $a < b$	$r = a + b\cos\theta$ $r = a + b\sin\theta$ $a > b$	$r = a + a\cos\theta$ $r = a + a\sin\theta$ *Special case of Limacon
General Graph				
Tips and Tricks ;)	a = length of petal If n is even, there are $2n$ petals. If n is odd, there are n petals.	$a < b$ means there is a loop.	$a > b$ means there is a dimple.	Centered at (0, 0) when $a = b$.

sin is symmetric over the y-axis.

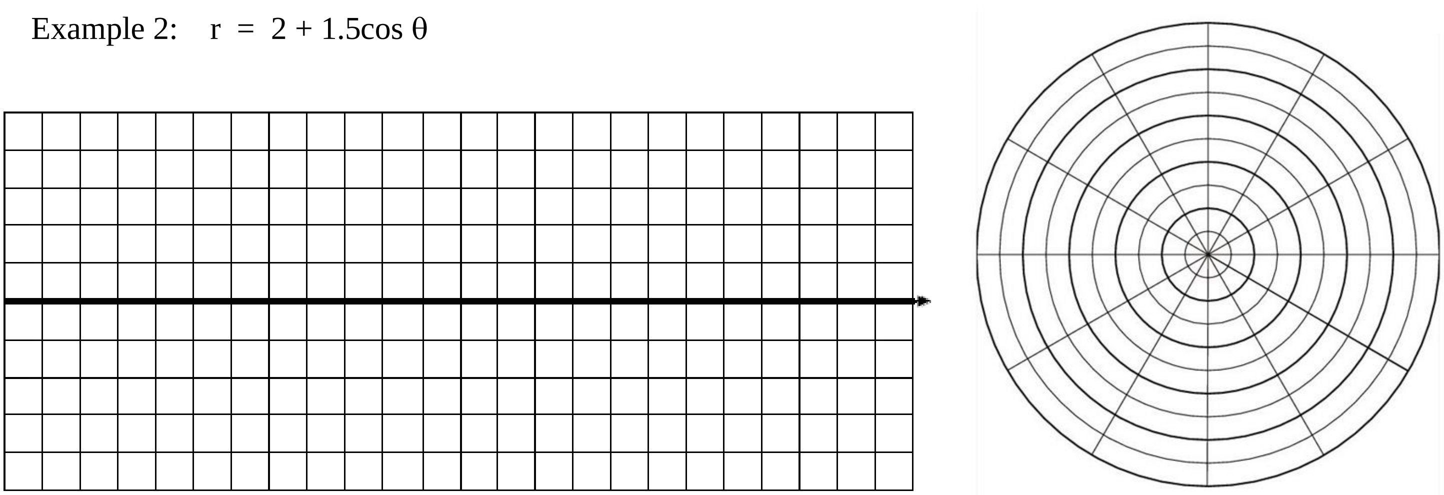
cos is symmetric over the x-axis.

<u>Example 1</u>: $r = 4 \sin \theta$



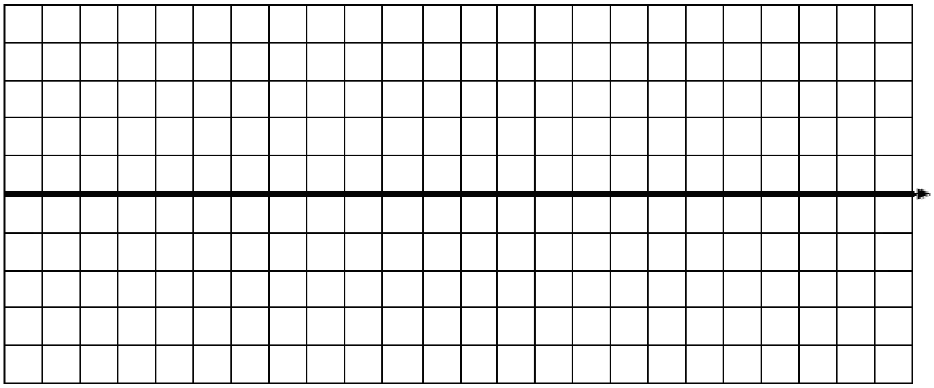
Shape of the Polar Curve:_____________________________

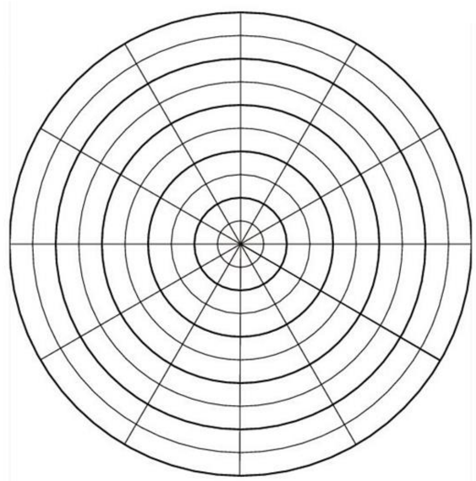
Example 2: $r = 2 + 1.5\cos \theta$



Shape of the Polar Curve:_____________________________

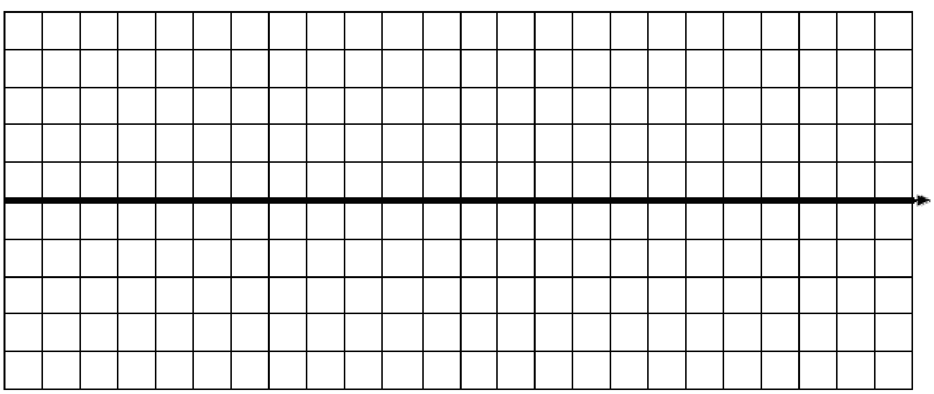
Example 3: $r = 2 + 3\cos\theta$

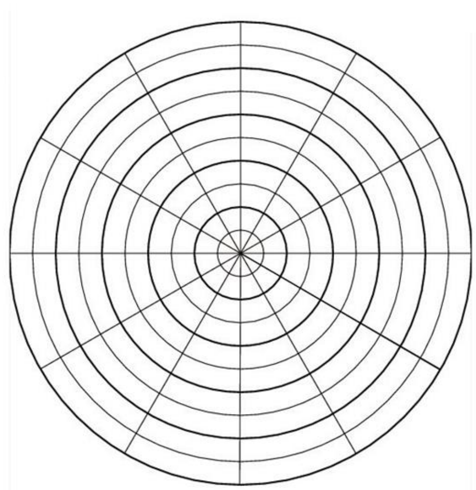




Shape of the Polar Curve:____________________________

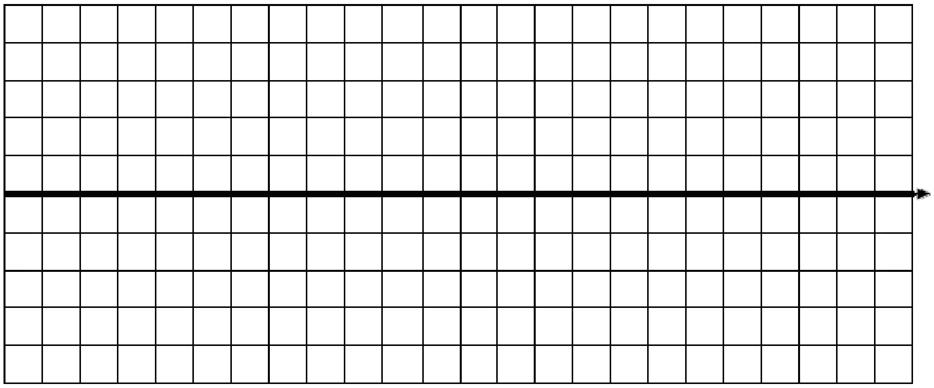
Example 4: $r = 4\sin 2\theta$

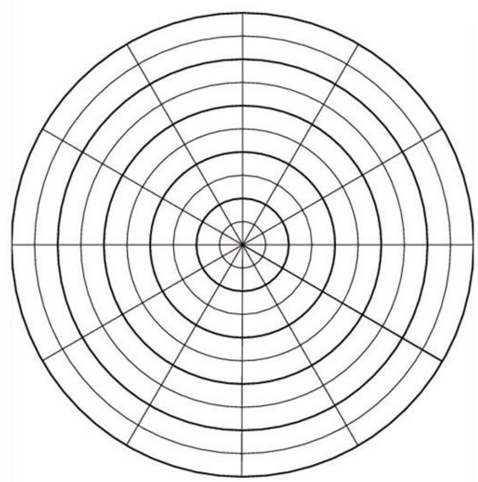




Shape of the Polar Curve:____________________________

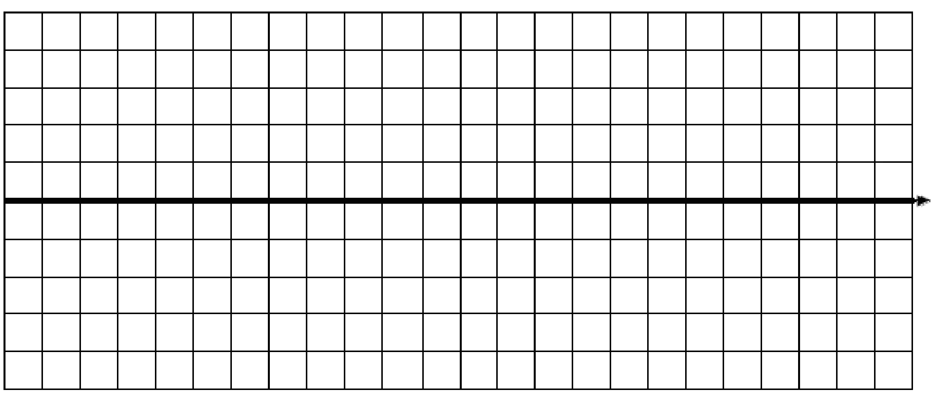
Example 5: $r = 2\cos 3\theta$

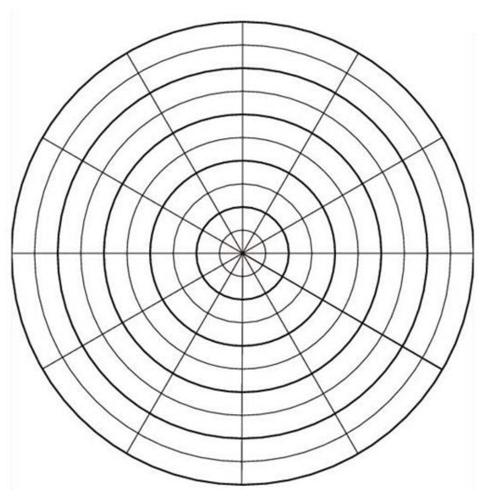




Shape of the Polar Curve:______________________________

Example 6: $r = 3 + 3\sin\theta$





Shape of the Polar Curve:______________________________

9.3 Switching Between Polar and Rectangular Forms

Objectives:

- Convert between Polar and Rectangular Form

Rectangular Form:
Polar Form:

Conversions:

From Rectangular to Polar

From Polar to Rectangular

<u>Examples:</u>
Express each of the following in the opposite form

a. $[-13, -70^{o}]$

b. (-8, -12)

c. $[5, \frac{\pi}{3}]$