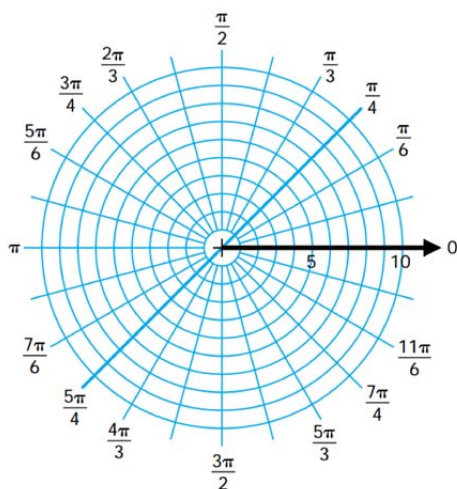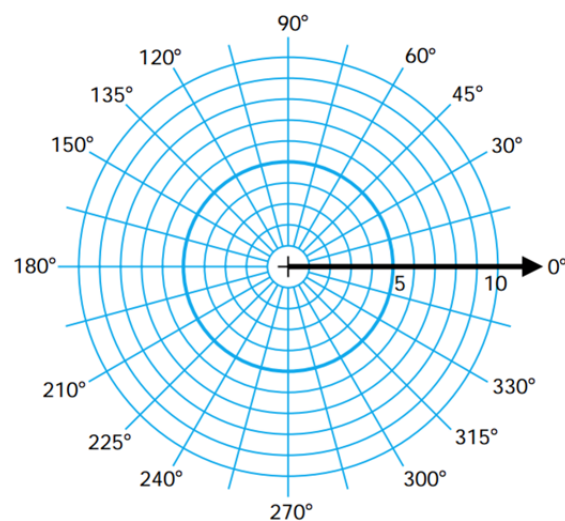# 13.2 Polar Coordinates

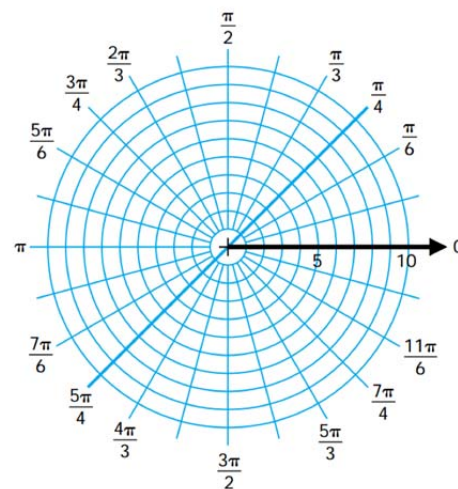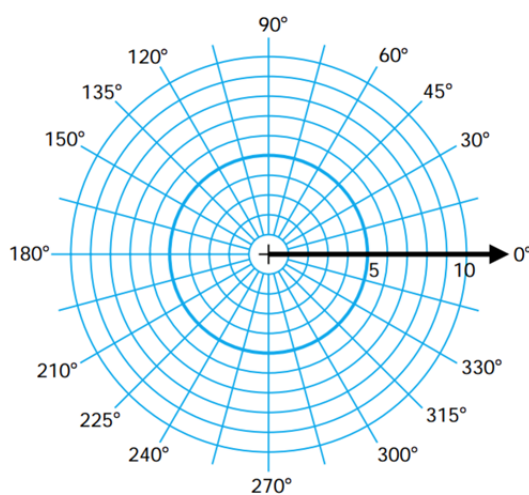Rectangular Coordinates

Polar Coordinates
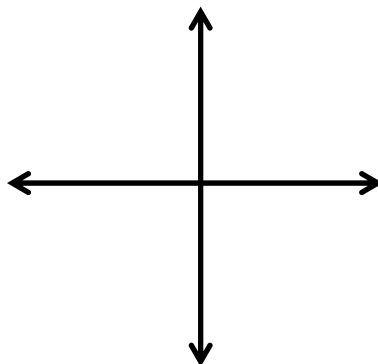
Polar Coordinates: (r, θ) with radians:

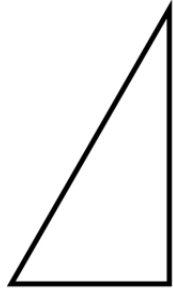
Polar Coordinates: (r, θ) with degrees:

Rename the following points 2 different ways

<u>Converting</u>

From Polar   To Rectangular

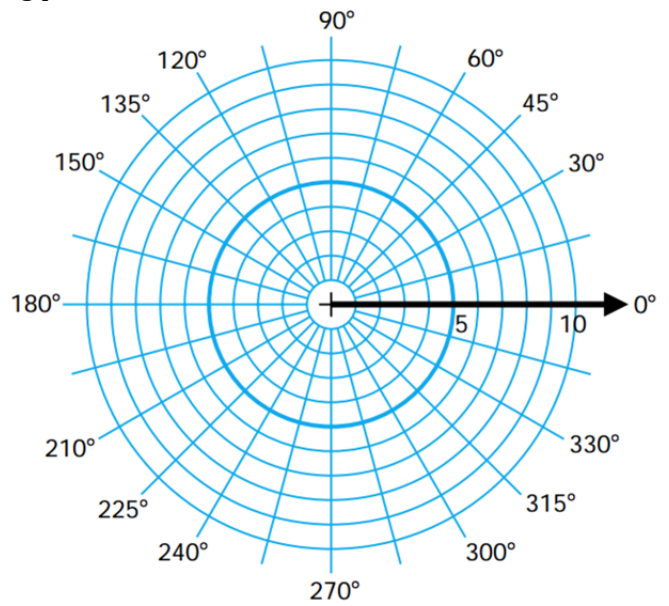From Rectangular   To Polar

<u>Convert to Polar (Radian answer)</u>   <u>Convert to Rectangular (3 decimal places)</u>

<u>Graph the equation by finding and plotting points.</u>

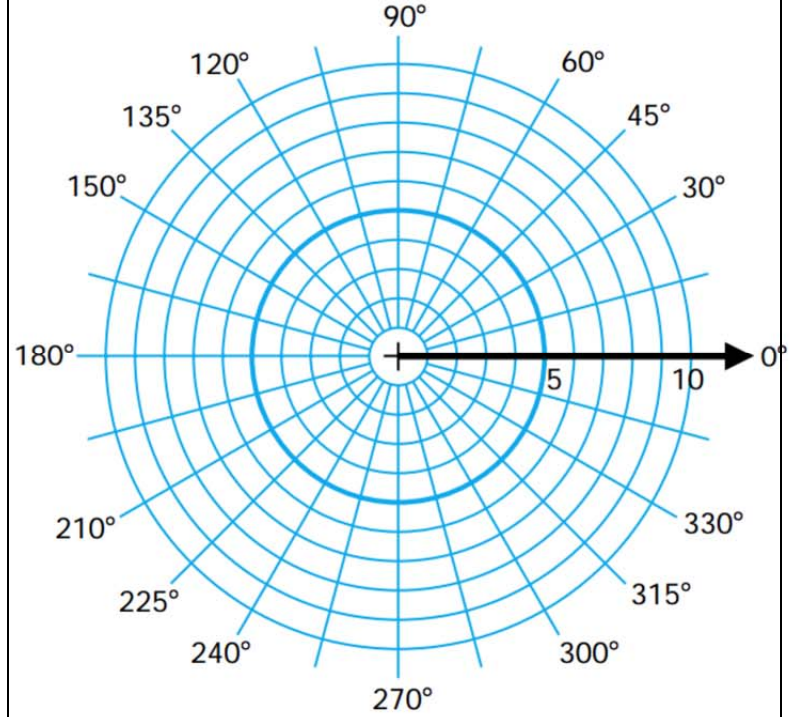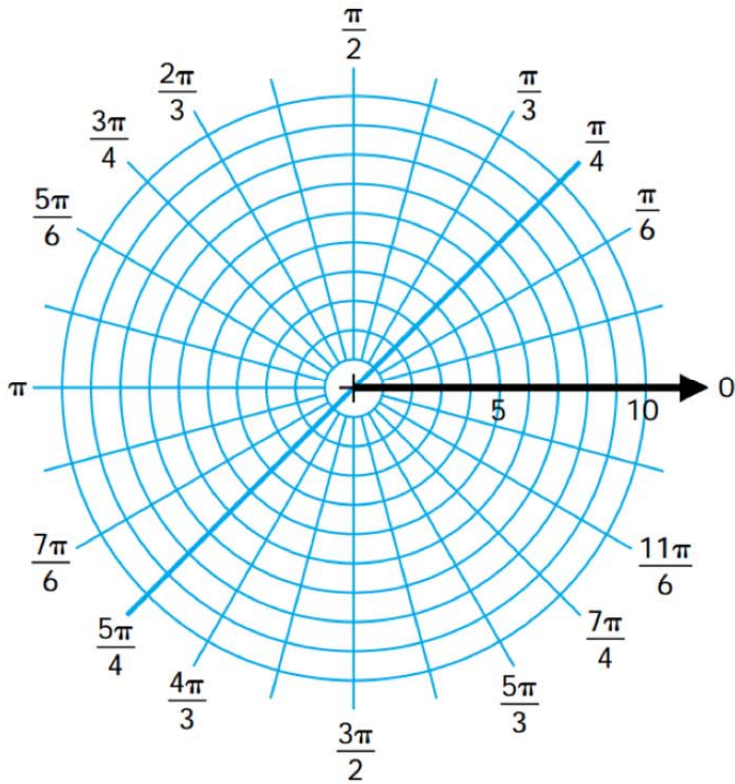| θ	r
30°	
45°	
60°	
90°	
120°	
135°	
150°	
180°	

SUMMARY:

Directions: Plot each point and label it.

1) $\left(2, \frac{\pi}{6}\right)$	2) $\left(-5, \frac{4\pi}{3}\right)$	3) $(-8, 240°)$	4) $(-3, -120°)$
5) $\left(7, -\frac{7\pi}{4}\right)$	6) $\left(-4, -\frac{3\pi}{2}\right)$	7) $(5, 540°)$	8) $(2, -150°)$

Directions: Rename the following point in two different ways, at least one with the opposite radius. Keep radians with radian answers, and degree with degree answers. (You could have literally infinitely many ways)

9) $\left(6, \frac{7\pi}{4}\right)$	10) $\left(-2, -\frac{5\pi}{3}\right)$	11) $(-4, 150°)$	12) $(7, -270°)$

Directions: Convert the following from Polar to Rectangular (round to 3 decimal places).

13) $\left(-5, \frac{3\pi}{4}\right)$	14) $\left(-8, -\frac{7\pi}{6}\right)$	15) $(4, 330°)$	16) $(7, -45°)$

Directions: Convert the following from Rectangular to Polar where $r \geq 0$, and $0° \leq \theta \leq 360°$
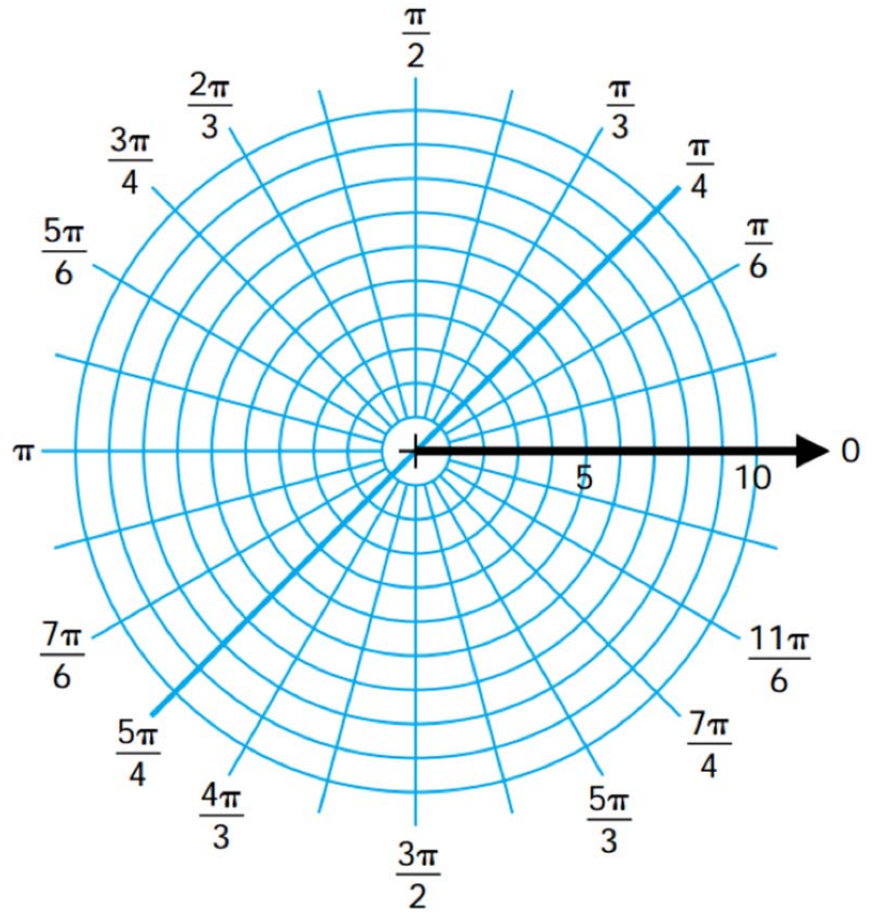
17) (5, 8)	18) (-4, 1)	19) (10, -3)	20) (-5, -12)

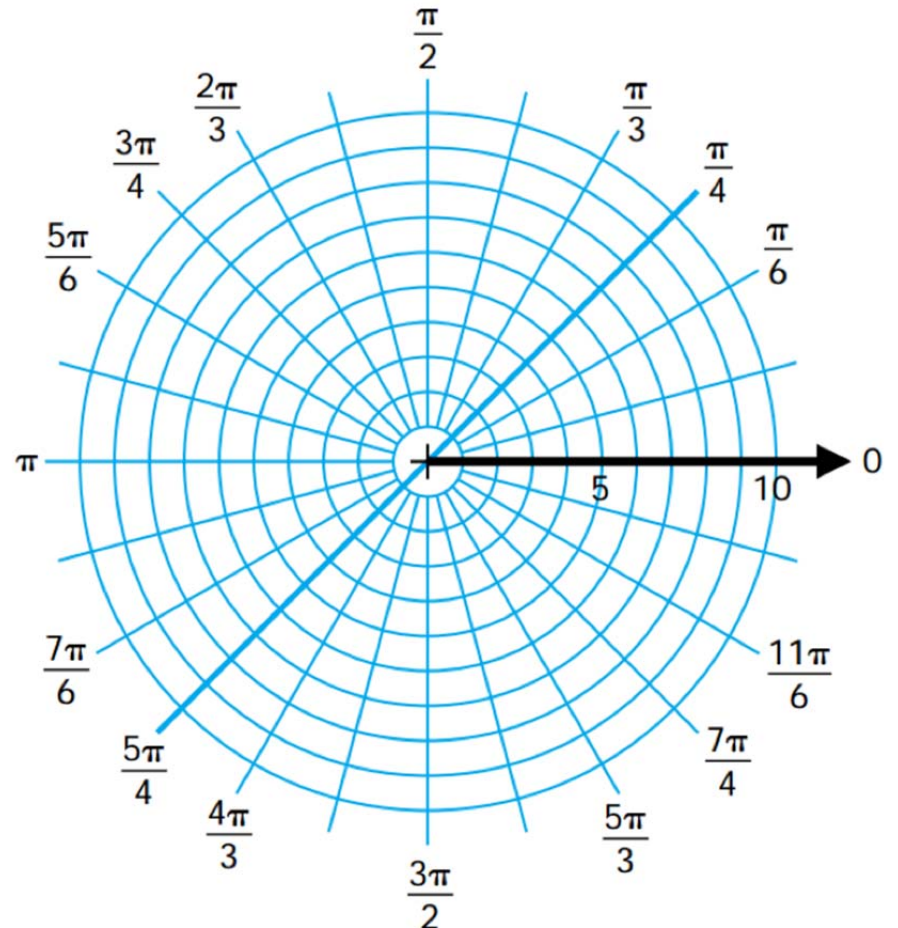Directions: Complete the table and plot the graph. (round to 2 decimals)

21) $r = \theta$

θ	r
0	
$\dfrac{\pi}{4}$	
$\dfrac{\pi}{2}$	
$\dfrac{3\pi}{4}$	
π	
$\dfrac{5\pi}{4}$	
$\dfrac{3\pi}{2}$	
$\dfrac{7\pi}{4}$	
2π	

22) $r = 4 + 4\sin\theta$

θ	r
$\dfrac{3\pi}{2}$	
$\dfrac{11\pi}{6}$	
0	
$\dfrac{\pi}{6}$	
$\dfrac{\pi}{3}$	
$\dfrac{\pi}{2}$	
$\dfrac{2\pi}{3}$	
$\dfrac{5\pi}{6}$	
π	
$\dfrac{7\pi}{6}$	

REVIEW SKILLZ		
Find the next two terms and describe how the sequence is derived.		
1) $1, 1, 2, 3, 5$	2) $1, 5, 12, 22, 35$	3) $1, 6, 15, 28, 45, 66$

13.2 Polar Coordinates

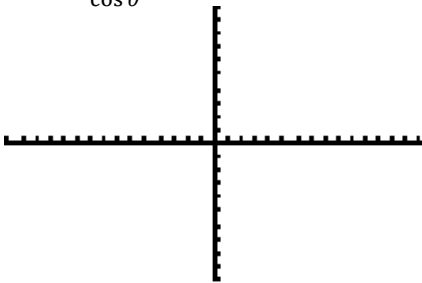1) Rename the following point two different ways.

$(-4, 150°)$

2) Convert the following to polar coordinates:

(-6, 2)

3) Typical Polar Graphs: **Make sure you watch the Application Walk Through Video to see how you should graph these.** After watching, sketch each graph of the following below.
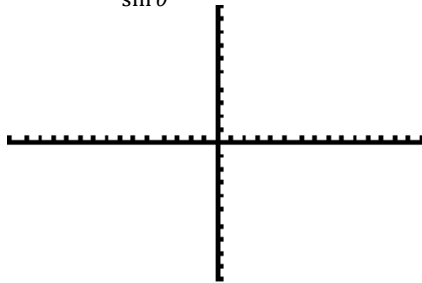
A) Straight Lines:
$r = \frac{3}{\cos \theta}$

B) Straight Lines:
$r = \frac{3}{\sin \theta}$

C) Circle 1:
r = 4

What happens if you make the 3 negative?

What happens if you make the 3 negative?
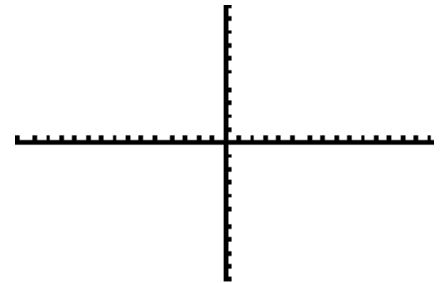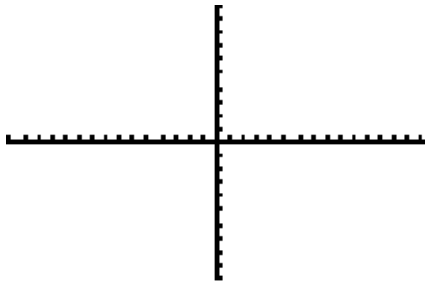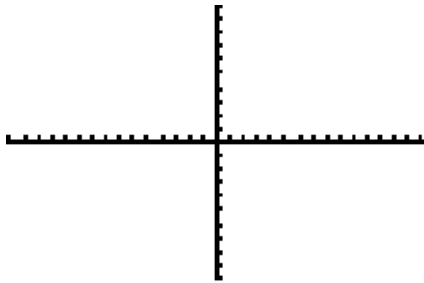
What happens when you change the 4 to 8?
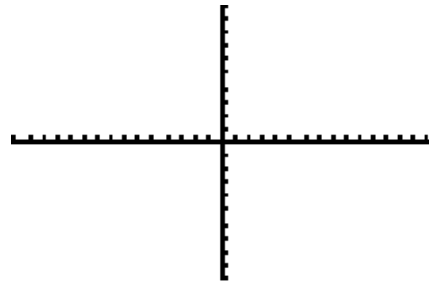
D) Circle 2:
$$r = 9\cos\theta$$

What happens when you make
the 9 negative?
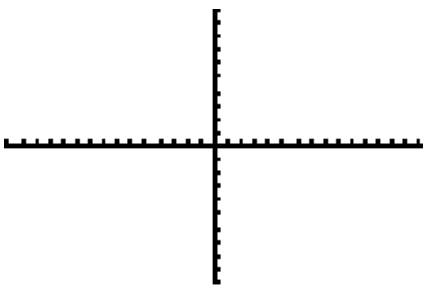
E) Circle 3:
$$r = 9\sin\theta$$

What happens when you make
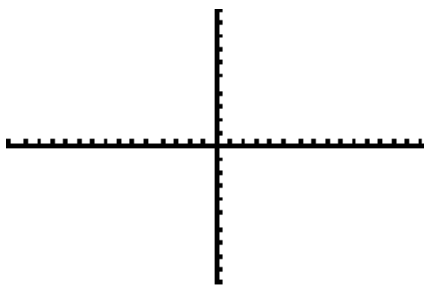the 9 negative?

F) Cardioid 1:
$$r = 6 + 6\cos\theta$$

How do you change the equation
to reflect the graph in the y-axis?
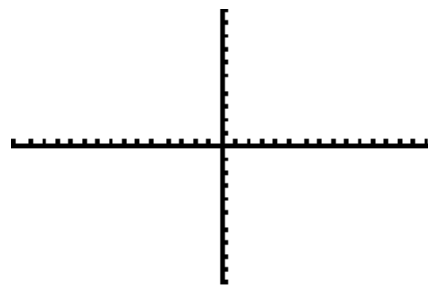
G) Cardioid 2:
$$r = 4 + 4\sin\theta$$

How do you change the equation
to reflect the graph in the x-axis?

H) Bean's 3 Leaf Girlfriend:
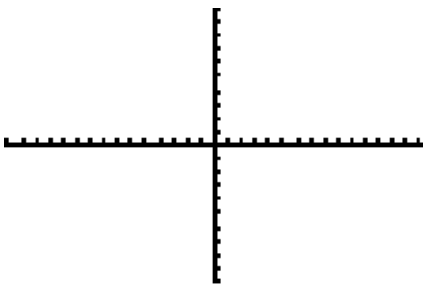3-Leafed Rose Graph:
$$r = 8\cos 3\theta$$

What happens when you change the
3 to a 5? To a 7?

I) Bean's 4 Leaf Girlfriend:
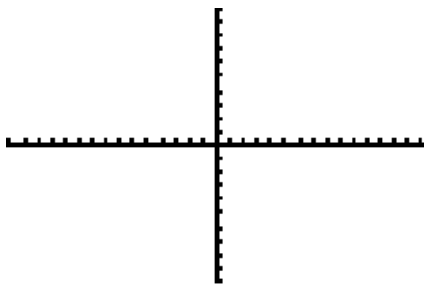4-Leafed Rose Graph:
$$r = 8\cos 2\theta$$

What happens when you change
the 2 to a 4? To a 6?

J) Archimedes' Spiral
$$r = 0.5\theta$$

What happens when you change
θmax in the WINDOW to 4π? To
6π?

K) Lemniscate
$$r = \sqrt{64\cos 2\theta}$$
Go to WINDOW and change
θ step to 0.01.

What happens when you change
the cosine to sine?