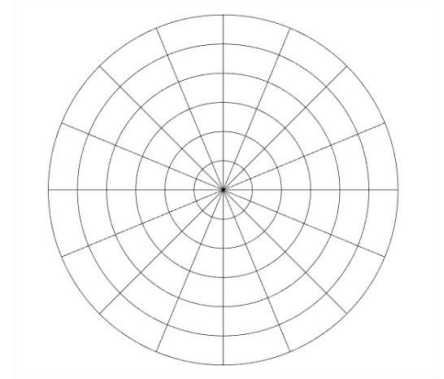


Lesson 8.2: Graphs of Polar Equations

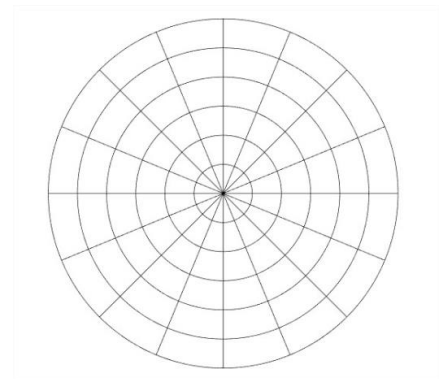
Sketching the Graph of Polar Equations

Examples:

1. Sketch a graph of the equation $r = 3$ and express the equation in rectangular coordinates.

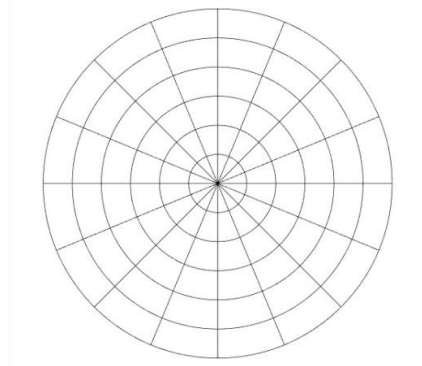


2. Sketch a graph of the equation $\theta = \frac{\pi}{3}$, and express the equation in rectangular coordinates.



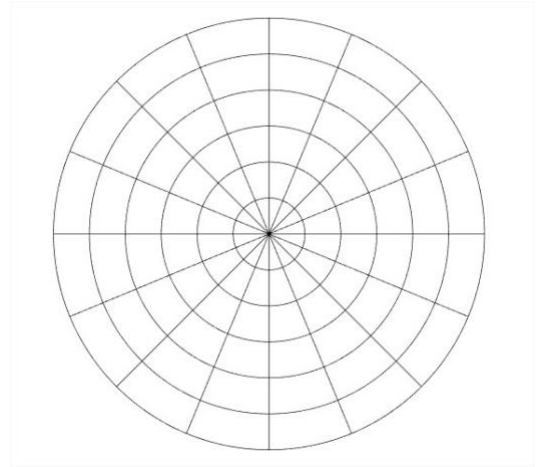
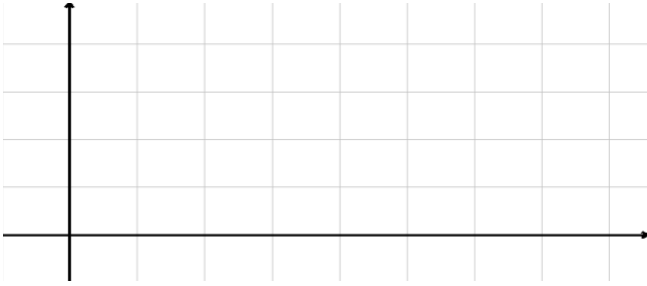
3. Sketch a graph of the polar equation $r = 2 \sin(\theta)$.

θ	0								π
$r = 2 \sin(\theta)$									



4. Sketch a graph of $r = 2 + 2\cos(\theta)$.

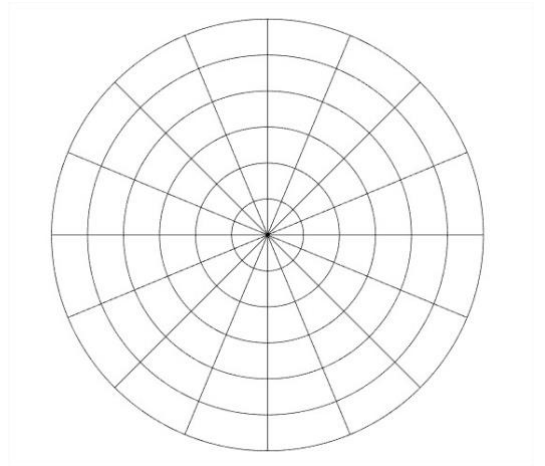
"r" Analysis:



The graph above is called a _____ because it is heart-shaped.

In general, the graphing form of a cardioid is:

5. Sketch the curve $r = \cos(2\theta)$.



The graph above is called a _____ curve.

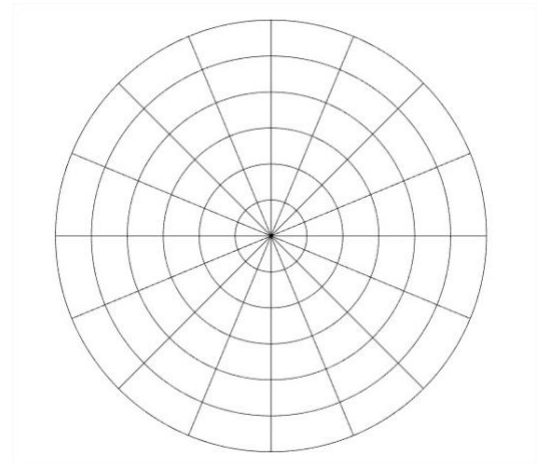
In general, the graphing form of a rose-petal curve is:

Tests for Symmetry of Polar Graphs

Symmetric About the Polar Axis	
Symmetric About the Pole	
Symmetric About the Vertical Line $\theta = \frac{\pi}{2}$	

Examples:

6. Sketch a graph of the equation $r = 1 + 2 \cos(\theta)$. It may help to find the symmetry and zeros.



The curve above is called a _____, after the Middle French word for snail.

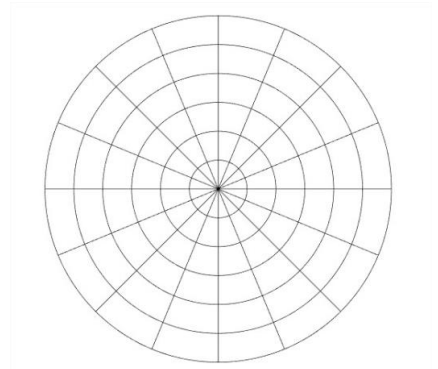
In general, the equation of a graph of this form is:

Graphing Polar Equations with a Graphing Device

1. Press "MODE":
 - a. Change the mode to "polar mode".
 - b. Check radians/degrees to make sure the mode fits the units you are using as an input.
2. Adjust the window of the graph before you graph your equation.
3. Press "2nd" "ZOOM"
 - a. Highlight "POLAR GC" and press "ENTER"
4. Finally, press "Y=" and graph your polar equation.

Examples:

7. Use a graphing calculator to graph $r = \sin(\theta) + \sin^3\left(\frac{5\theta}{2}\right)$. Sketch the graph on the axes at right.



SOME COMMON POLAR CURVES				
Circles and Spiral				
$r = a$ circle	$r = a \sin \theta$ circle	$r = a \cos \theta$ circle	$r = a\theta$ spiral	
Limaçons				
$r = a \pm b \sin \theta$ $r = a \pm b \cos \theta$ ($a > 0, b > 0$) Orientation depends on the trigonometric function (sine or cosine) and the sign of b .				
$a < b$ limaçon with inner loop	$a = b$ cardioid	$a > b$ dimpled limaçon	$a \geq 2b$ convex limaçon	
Roses				
$r = a \sin n\theta$ $r = a \cos n\theta$ n -leaved if n is odd $2n$ -leaved if n is even				
$r = a \cos 2\theta$ 4-leaved rose	$r = a \cos 3\theta$ 3-leaved rose	$r = a \cos 4\theta$ 8-leaved rose	$r = a \cos 5\theta$ 5-leaved rose	
Lemniscates				
Figure-eight-shaped curves				
$r^2 = a^2 \sin 2\theta$ lemniscate	$r^2 = a^2 \cos 2\theta$ lemniscate			