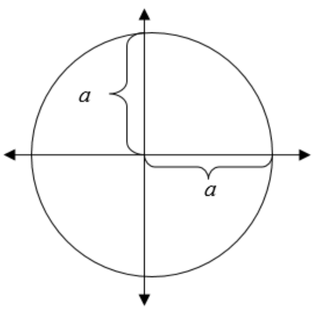
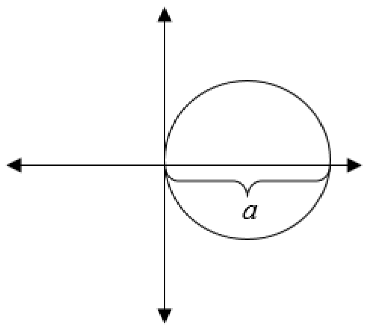
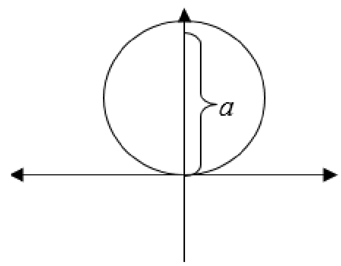
Math 265B: Graphs of Common Polar Equations Summary

Lines in Polar Coordinates:

Vertical Lines	**Horizontal Lines**	**Lines through the Origin:**
Rectangular: $x = a$	Rectangular: $y = b$	Rectangular: $y = mx$
Polar: $r = a\sec(\theta)$	Polar: $r = a\csc(\theta)$	Polar: $\theta = \theta_O$, $m = \tan(\theta_O)$

Circles in Polar Coordinates:

Circle Centered at the origin: $r = a$	$r = a\cos\theta$	$r = a\sin\theta$
		

Rose Curves: ***a*** is the "height" (or length) of each petal.

$r = a\cos(n\theta)$

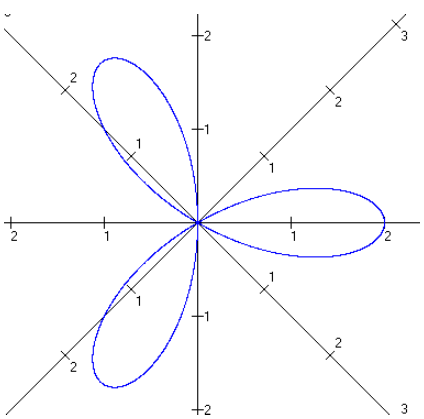
One petal is symmetric to x-axis,
if n is even then symmetric to both axes.

$r = a\sin(n\theta)$

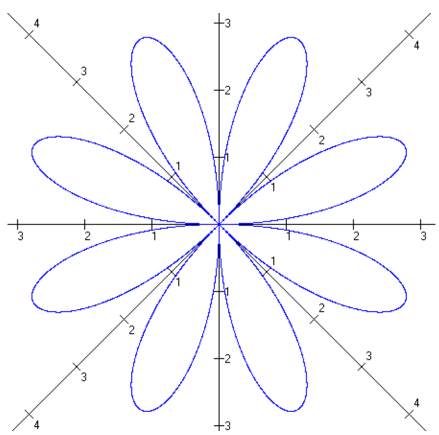
May be symmetric to y-axis.

If n is odd, there will be **n petals.
Some examples:

If n is even, there will be **2n** petals.



$r = 2\cos(3\theta)$

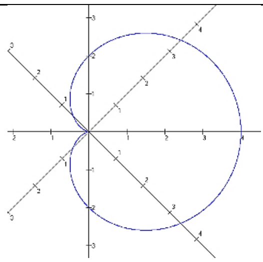
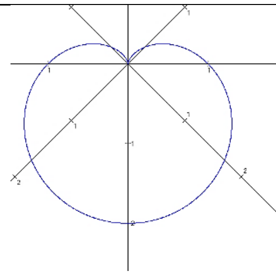
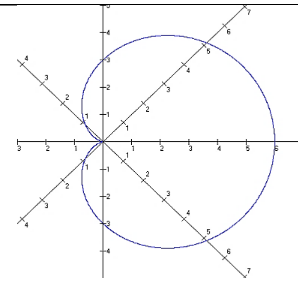


$r = 3\sin(4\theta)$

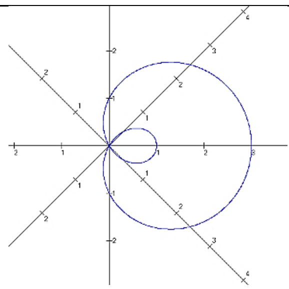
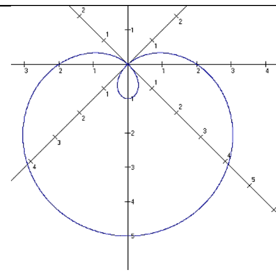
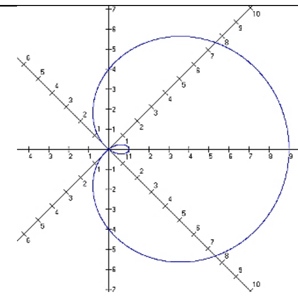
Limaçons: $r = a + b\cos\theta$ $r = a + b\sin\theta$

To **determine shape:**

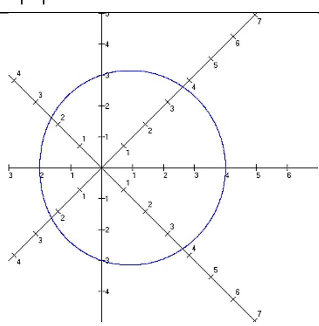
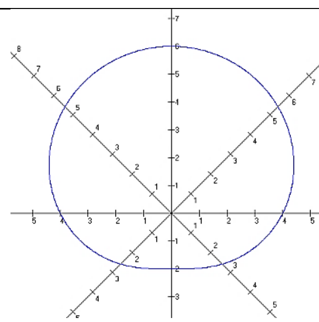
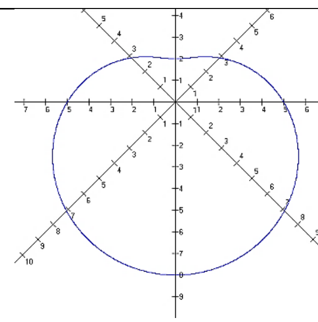
If $|a| = |b|$, creates a heart-shaped **cardiod**. These have a "cusp".

 $r = 2 + 2\cos\theta$	 $r = -1 - \sin\theta$	 $r = -3 + 3\cos\theta$

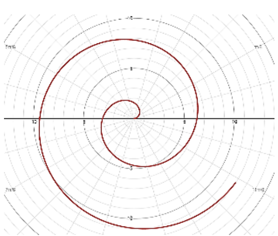
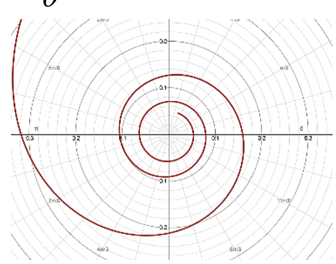
If $|a| < |b|$, creates an **inner loop**:

 $r = 1 + 2\cos\theta$	 $r = 2 - 3\sin\theta$	 $r = -4 + 5\cos\theta$

If $|a| > |b|$, creates **no** cusp **nor** inner loop. It looks like a slightly squashed circle.

 $r = 3 + \cos\theta$	 $r = -4 + 2\sin\theta$	 $r = -5 - 3\sin\theta$

Spirals:

$r = k\theta$ (spirals out)  Example: $r = \theta$	$r = \dfrac{k}{\theta}$ (spirals in)  Example: $r = \dfrac{1}{\theta}$