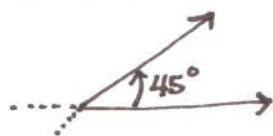
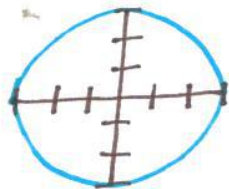


# Graphing Polar Equations (Section 7.2: Polar Packet)

\* Ray:  $\theta = 45^\circ$



\* Circle:  $r = 3$



OR  $r = 2a \cos \theta$

drawn on the x-axis

$|a| = \text{radius}$   
 $(a, 0) : \text{center}$

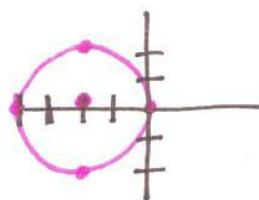
OR  $r = 2a \sin \theta$

drawn on the y-axis

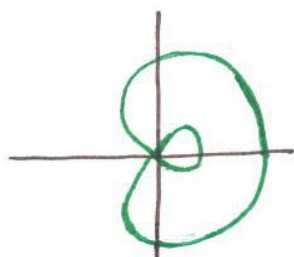
$|a| = \text{radius}$   
 $(0, a) : \text{center}$

ex:  $r = -4 \cos \theta = 2(-2) \cos \theta$

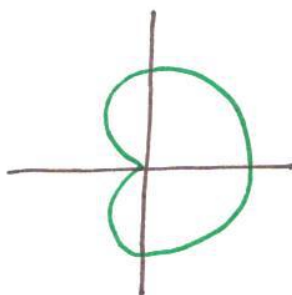
radius = 2  
center:  $(-2, 0)$



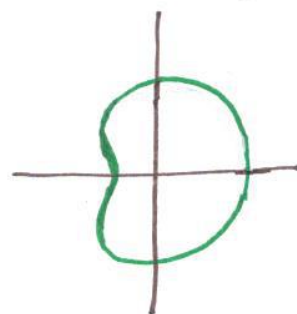
\* Limaçon:  $r = a \pm b \cos \theta$  OR  $r = a \pm b \sin \theta$



If  $a < b$ , there is an extra loop



If  $a = b$ , it is called a Cardioid.



If  $a > b$ , there is no extra loop.

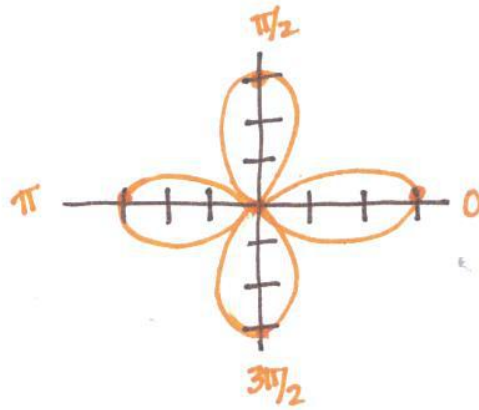
\* Roses:  $r = a \cos(n\theta)$  OR  $r = a \sin(n\theta)$

If "n" is an odd number  $\rightarrow$  n petals

If "n" is an even number  $\rightarrow$  2n petals

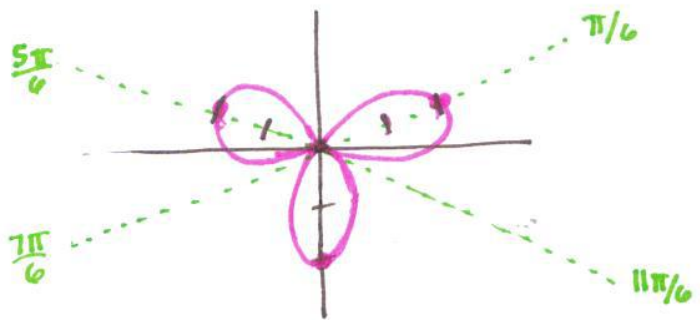
ex:  $r = 3 \cos 2\theta \rightarrow 4$  petals

$\theta$	$r = 3 \cos 2\theta$
0	$3 \cos 0 = 3$
$\pi/2$	$3 \cos \pi = -3$
$\pi$	$3 \cos 2\pi = 3$
$3\pi/2$	$3 \cos 3\pi = -3$



ex:  $r = 2 \sin 3\theta \rightarrow 3$  petals

$\theta$	$r = 2 \sin 3\theta$
0	$2 \sin 0 = 0$
$\pi/3$	$2 \sin \pi = 0$
$\pi/6$	$2 \sin 3\pi/6 = 2$
$5\pi/6$	$2 \sin 15\pi/6 = 2$
$7\pi/6$	$2 \sin 21\pi/6 = -2$
$11\pi/6$	$2 \sin 33\pi/6 = -2$
$3\pi/2$	$2 \sin 9\pi/2 = 2$

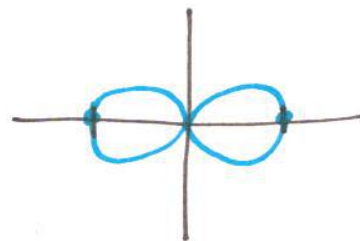


\* Use the value of "n" to help determine what  $\theta$ s to use!

#29  $r^2 = \cos 2\theta \rightarrow 4$  petals

$r = \sqrt{\cos 2\theta} \rightarrow 2$  petals

$\theta$	
0	$\sqrt{\cos 0} = 1$
$\pi/2$	$\sqrt{\cos \pi} = \text{undef.}$
$\pi$	$\sqrt{\cos 2\pi} = 1$
$3\pi/2$	$\sqrt{\cos 3\pi} = \text{undef.}$



\* Adjust the  $\theta$  step in calc to see it get close to  $(0,0)$ .