

Period of  $\sin/\cos = 2\pi$  Start by  $\frac{p}{4}$  to find  $\theta$  values to calculate

Precalculus

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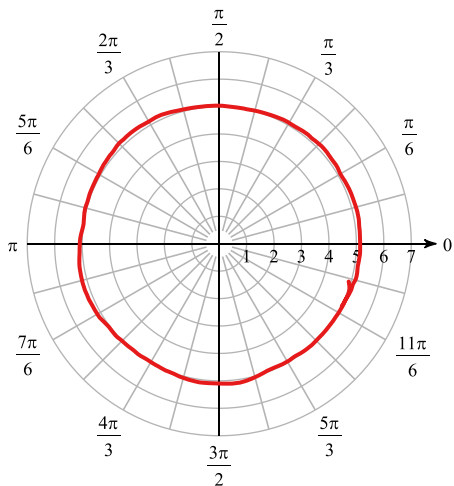
Name \_\_\_\_\_

## Graphing Polar Equations Notes

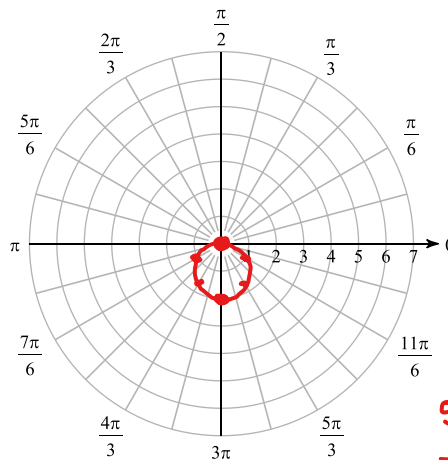
Date \_\_\_\_\_ Period \_\_\_\_\_

Consider each polar equation. Classify the curve; and sketch the graph.

1)  $r = 5$



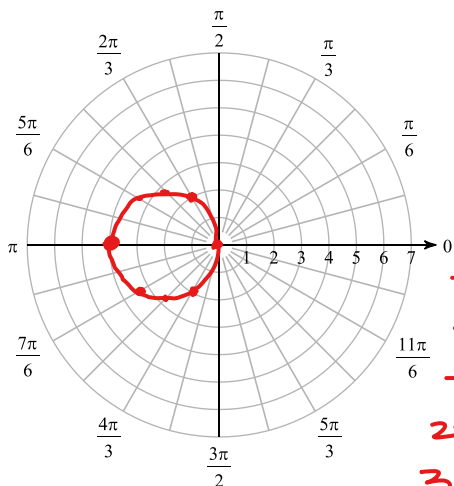
2)  $r = -2\sin \theta$



this circle graphed completely between 0 and  $\pi$

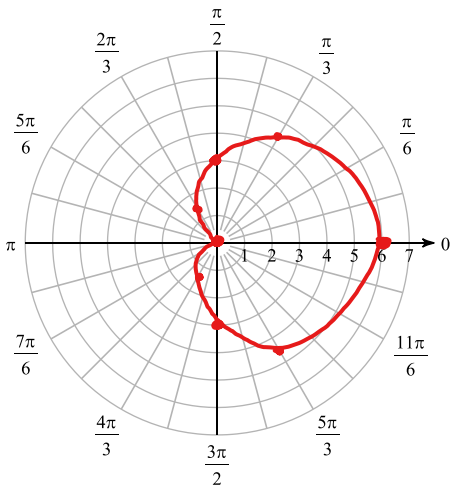
$\theta$	$r = -2\sin \theta$
0	0
$\pi/2$	-2
$\pi$	0
$3\pi/2$	2
$2\pi$	0
$\pi/6$	-1
$5\pi/6$	-1
$\pi/3$	$-\sqrt{3}$
$2\pi/3$	$-\sqrt{3}$

3)  $r = -4\cos \theta$



$\theta$	$r = -4\cos \theta$
0	-4
$\pi/6$	$-2\sqrt{3} \sim -3.4$
$\pi/4$	$-2\sqrt{2} \sim -2.8$
$\pi/3$	-2
$\pi/2$	0
$2\pi/3$	2
$3\pi/4$	$2\sqrt{2}$
$5\pi/6$	$2\sqrt{3}$
$\pi$	4

4)  $r = 3 + 3\cos \theta$

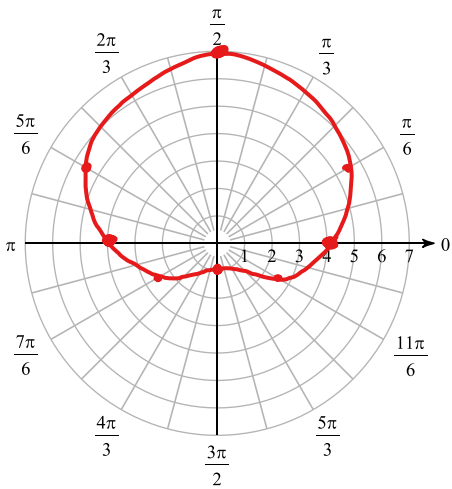


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$\theta$	$r = 3 + 3\cos \theta$	$\theta$	$r$
0	6	$\pi/3$	4.5
$\pi/2$	3	$2\pi/3$	1.5
$\pi$	0	$4\pi/3$	1.5
$3\pi/2$	3	$5\pi/3$	4.5
$2\pi$	6		

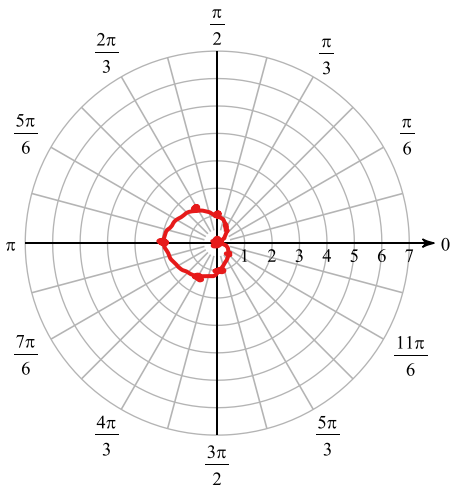
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5)  $r = 4 + 3\sin \theta$



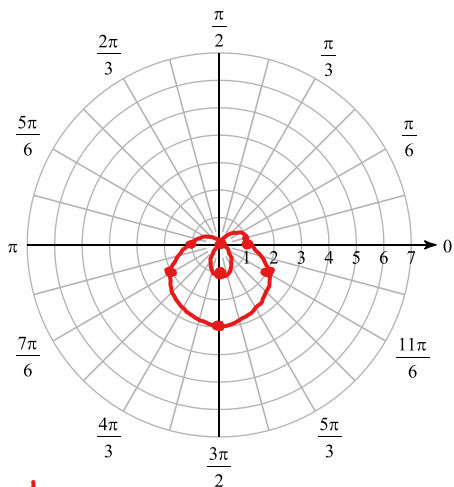
$\theta$	$r = 4 + 3\sin \theta$	$\theta$	$r$
0	4	$\pi/6$	5.5
$\pi/2$	7	$5\pi/6$	5.5
$\pi$	4	$7\pi/6$	2.5
$3\pi/2$	1	$11\pi/6$	2.5
$2\pi$	4		

6)  $r = 1 - \cos \theta$



$\theta$	$r = 1 - \cos \theta$	$\theta$	$r$
0	0	$\pi/3$	1/2
$\pi/2$	1	$2\pi/3$	1 1/2
$\pi$	2	$4\pi/3$	1 1/2
$3\pi/2$	1	$5\pi/3$	1/2
$2\pi$	0		

7)  $r = 1 - 2\sin \theta$

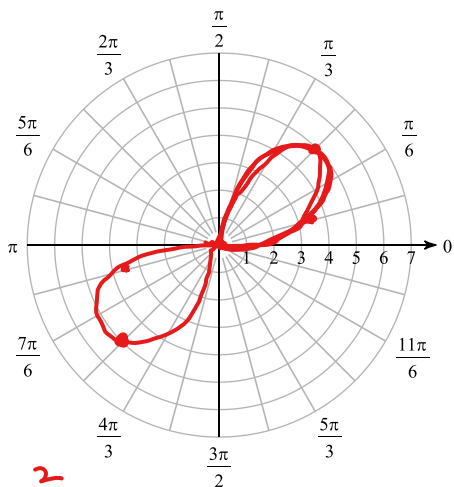


limaçon w/ an inner loop

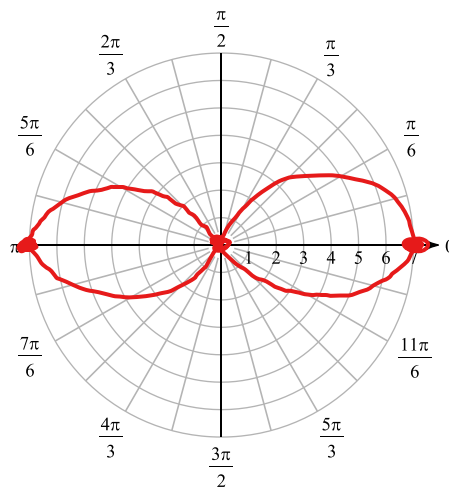
$\theta$	$r = 1 - 2\sin \theta$
0	1
$\pi/2$	-1
$\pi$	1
$3\pi/2$	3
$2\pi$	1

$\theta$	$r$
$\pi/6$	0
$5\pi/6$	0
$7\pi/6$	2
$11\pi/6$	2

8)  $r^2 = 25\sin(2\theta)$  lemniscate



9)  $r^2 = 49\cos(2\theta)$



$\theta$	$r^2 = 25(\sin(2\theta))$
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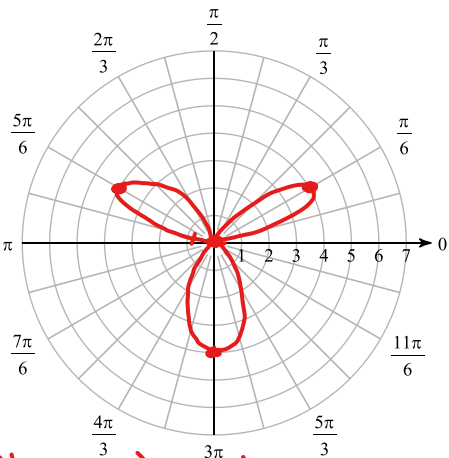
0	$r^2 = 0$
$\pi/4$	$r^2 = 25$
$\pi/2$	$r^2 = 0$
$3\pi/4$	$r^2 = -25$ (imaginary)
$\pi$	$r^2 = 0$
$5\pi/4$	$r^2 = -25$
$3\pi/2$	$r^2 = 0$
$7\pi/4$	$r^2 = 25 \rightarrow r = \pm\sqrt{25} = \pm 5$
$2\pi$	$r^2 = 0$

~ 34 or 50

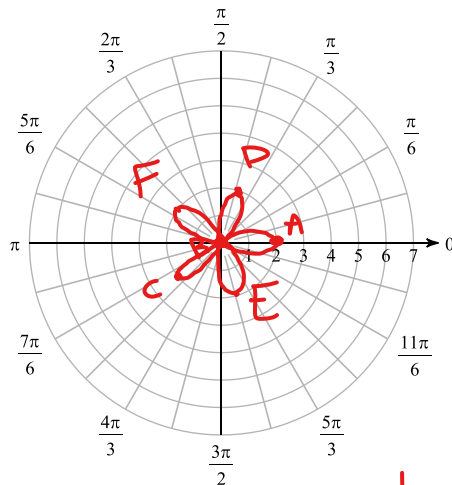
$\theta$	$r^2 = 49\cos(2\theta)$
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0	$r^2 = 49$
$\pi/2$	$r^2 = -49$
$3\pi/4$	$r^2 = 0$
$\pi$	$r^2 = 49$
$5\pi/4$	$r^2 = 0$
$3\pi/2$	$r^2 = -49$
$7\pi/4$	$r^2 = 0$
$2\pi$	$r^2 = 49$

length of petals  $\downarrow$  # of petals  $\downarrow$   
 10)  $r = 4\sin(3\theta)$  ROSE



11)  $r = 2\cos(5\theta)$



$\frac{2\pi}{10} = \frac{180^\circ}{5} = 36^\circ$   
 $\frac{4\pi}{10} = 72^\circ$   
 $\frac{6\pi}{10} = 108^\circ$   
 $\frac{8\pi}{10} = 144^\circ$

$\theta$	$r = 4\sin(3\theta)$	$\theta$	$r$
0	$r = 0$	$5\pi/6$	$r = 4$
$\pi/6$	$r = 4$	$\pi$	$r = 0$
$\pi/3$	$r = 0$		
$\pi/2$	$r = -4$		
$2\pi/3$	$r = 0$		

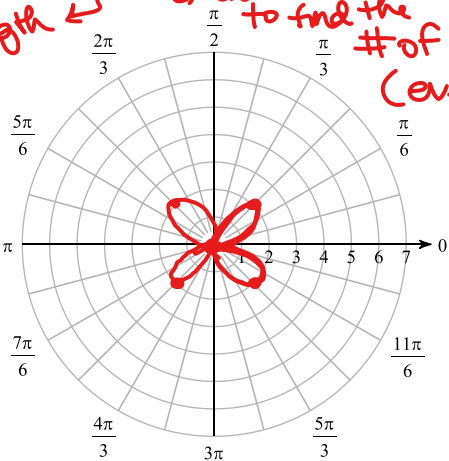
$0 \leftrightarrow \pi$

$\theta$	$r = 2\cos(5\theta)$	$\theta$	$r$
0	$r = 2$	$6\pi/10$	$r = -2$
$\pi/10$	$r = 0$	$8\pi/10$	$r = 2$
$2\pi/10$	$r = -2$		
$3\pi/10$	$r = 0$		
$4\pi/10$	$r = 2$		

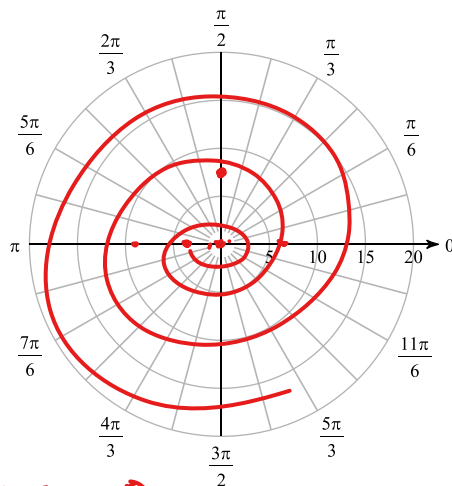
$0 \leftrightarrow \pi$

12)  $r = 2\sin(2\theta)$

length  $\leftarrow$   $\rightarrow$  double it to find the # of petals (even)



13)  $r = \theta, \theta > 0$



$\pi = 3.14 \dots$

Archimedes spiral

$\theta$	$r = 2\sin(2\theta)$	$\theta$	$r$
0	0	$3\pi/4$	-2
$\pi/4$	2	$\pi$	0
$\pi/2$	0	$5\pi/4$	2

$\theta$	$r = \theta$
0	0
$\pi/6$	$\pi/6 = .518$
$\pi$	3.14
$2\pi$	6.28
$3\pi$	9.42
$5\pi/2$	$\frac{5}{2}(3.14) \approx \frac{15}{2} \sim 7.5$ or so