

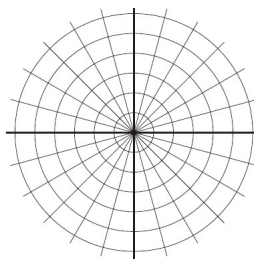
# 10.8 day 2.notebook

## Warm up

1. Convert to rectangular form and sketch.

a.  $r = -6\sin\theta$

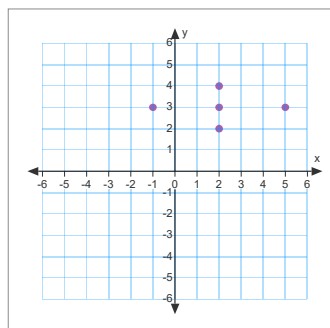
b.  $r = 5$



2. Name three equivalent points for  $\left(-6, -\frac{\pi}{3}\right)$

3. Find the rectangular equation by eliminating the parameter. State the domain and range and sketch the graph.

$$x = 2 - 3\cos t \quad y = 3 - \sin t$$



Apr 23-9:34 AM

## GO COUGARS!

### Homework Questions

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In Exercises 65–70, describe the graph of the polar equation and find the corresponding rectangular equation. Sketch its graph.

65. $r = 6$	66. $r = 8$
67. $\theta = \frac{\pi}{6}$	68. $\theta = \frac{3\pi}{4}$
69. $r = 3 \sec \theta$	70. $r = 2 \csc \theta$

$$r = 3 \sec \theta$$

$$r = \frac{3}{\cos \theta}$$

$$r \cos \theta = 3$$

$$x = 3$$

$$r = 2 \csc \theta$$

$$r = \frac{2}{\sin \theta}$$

$$r \sin \theta = 2$$

$$y = 2$$

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In Exercises 17–40, sketch the graph of the polar equation using symmetry, zeros, maximum  $r$ -values, and any other additional points.

17. $r = 5$	18. $r = 2$
19. $r = \frac{\pi}{6}$	20. $r = -\frac{3\pi}{4}$
21. $r = 3 \sin \theta$	22. $r = 4 \cos \theta$

Part 1

1. $r = 3$	5. $r = -2 \sin \theta$	9. $r = 1 + 3 \cos \theta$
2. $r = -4 \sin \theta$	6. $r = -2 \cos \theta$	10. $r = 4 \sec \theta$
3. $\theta = -\frac{\pi}{2}$	7. $r = 1 + 1 \sin \theta$	11. $r = 3 + 2 \cos \theta$
4. $r = -2$	8. $r = 2 - 3 \cos \theta$	12. $\theta = \frac{5\pi}{6}$

Feb 2-9:51 PM

## 10.8 Graphs of Polar Equations - Day 2

### Generalizations So Far!

1.  $r = a$  circle with center  $(0, 0)$  and radius =  $a$

2.  $\theta = \text{rad}$  line through  $\theta$

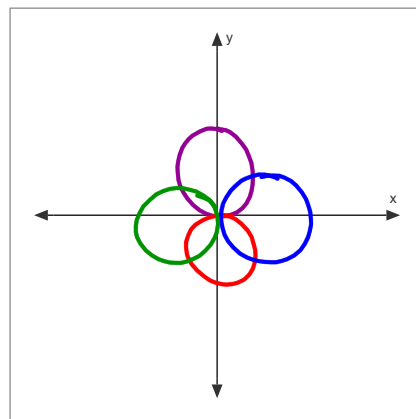
3.  $r = 2a \sin \theta$

4.  $r = -2a \sin \theta$

5.  $r = 2a \cos \theta$

6.  $r = -2a \cos \theta$

circle with radius of 'a'



## General Form of Polar Equations

$$r = a \pm b \cos \theta$$

$$r = a \pm b \sin \theta$$

Types: Cardioid  $\frac{a}{b} = 1$  a = b

Limacon with inner loop  $\frac{a}{b} < 1$  a < b

Dimpled Limacon  $1 < \frac{a}{b} < 2$  a > b

Convex Limacon  $\frac{a}{b} \geq 2$

Apr 26-9:10 AM

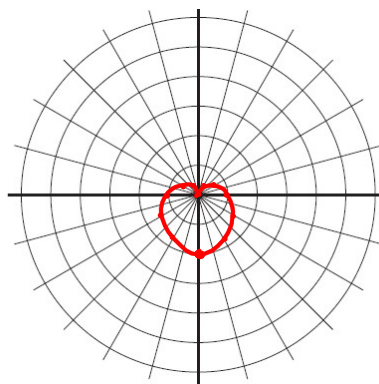
### 1. Cardioid a = b

$$r = 1 - \sin \theta$$

tip is down

|a| + |b| = tip

$\theta$	$r$
0	2
$\frac{\pi}{6}$	1.87
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{2}$	1
$\frac{3\pi}{4}$	$\frac{1}{2}$
$\pi$	.13
$\frac{5\pi}{4}$	0



$$r = a \pm b \cos \theta$$

$$r = a \pm b \sin \theta$$

symmetry with trig axis

tip  $|a| + |b|$  in direction of coefficient and trig function

sides  $|a|$

Apr 19-10:25 AM

## 2. Limacon with inner loop (loopy limaçon) $a < b$

$$r = a \pm b \cos \theta$$

$$r = a \pm b \sin \theta$$

symmetry with trig axis

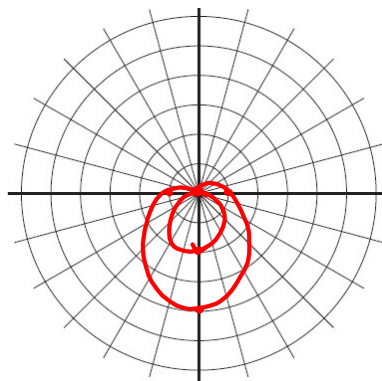
tip  $|a| + |b|$  in direction of coefficient and trig function

sides  $|a|$

loop  $|b| - |a|$  towards the tip and through the pole

Apr 19-10:25 AM

$$r = 1 - 3 \sin \theta$$



Apr 26-8:58 AM

### 3. Dimpled/Convex Limacon $a > b$

$$r = a \pm b \cos \theta$$

$$r = a \pm b \sin \theta$$

symmetry with trig axis

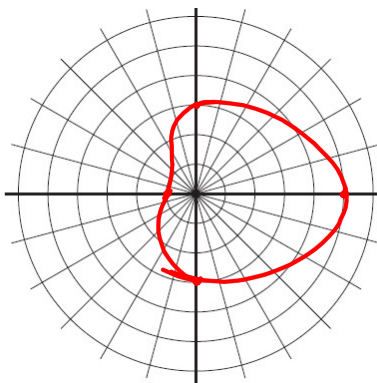
tip  $|a| + |b|$  in direction of coefficient and trig function

sides  $|a|$

dimple  $|a| - |b|$  away from the tip

Apr 26-9:00 AM

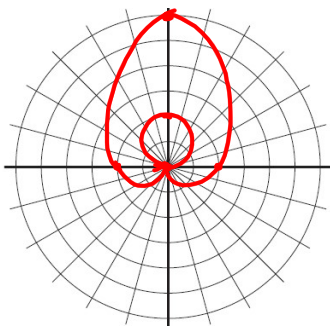
$$r = 3 + 2 \cos \theta$$



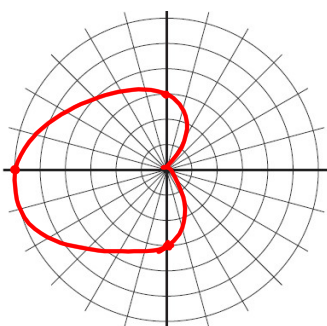
Apr 26-9:03 AM

### You try!!

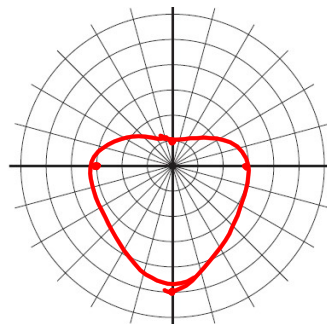
$$r = 2 + 4\sin\theta$$



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



$$r = 3 - 2\sin\theta$$



Apr 26-9:04 AM

### Testing for polar symmetry

$$r = 3 + 2\cos\theta$$

polar axis - substitute  $-\theta$  for  $\theta$  or  $(-r, \pi - \theta)$

$(r, \theta)$   $r = 3 + 2\cos(\theta)$   $\rightarrow$  invisible flip  $= 3 + 2\cos\theta$  ✓

$(-r, \theta)$   $-r = 3 + 2\cos(-\theta)$   
 $-r = 3 + 2\cos\theta$   
 $r = -3 - 2\cos\theta$  ✗

pole - substitute  $-r$  or  $(r, \pi + \theta)$

$(r, \theta)$   $r = 3 + 2\cos(\pi - \theta)$   
 $r = 3 + 2(\cos\pi \cos\theta + \sin\pi \sin\theta)$   
 $r = 3 - 2\cos\theta$  ✗

$(-r, \theta)$   $-r = 3 + 2\cos(\pi + \theta)$   
 $-r = 3 + 2(\cos\pi \cos\theta - \sin\pi \sin\theta)$   
 $-r = 3 - 2\cos\theta$  ✗

*Sum & difference formula* (pointing to  $\cos(\pi - \theta)$ )

*fake negative* (pointing to  $r = -3 + 2\cos\theta$ )

Symmetry with polar axis only

May 6-6:17 AM

# HOMEWORK



p 791 11-13 odd, 23-31 odd

Feb 2-9:51 PM