

Warm up

- Convert to rectangular form and sketch.
 - $r = -6\sin\theta$ $x^2 + (y+3)^2 = 9$
 - $r = 5$ $x^2 + y^2 = 25$
- Name three equivalent points for $(-6, -\frac{\pi}{3})$

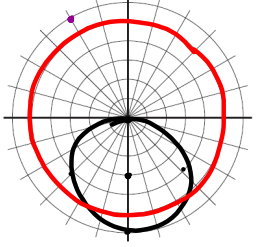
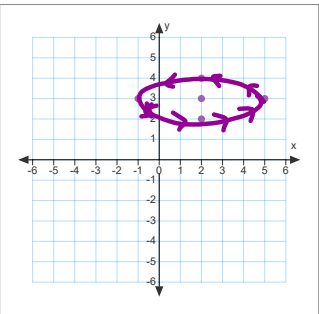
$r > 0$ $(0, 2\pi)$ $(6, \frac{2\pi}{3})$ $r < 0$ $(0, 2\pi)$ $(-6, \frac{5\pi}{3})$
 $r > 0$ $(2\pi, +\pi)$ $(6, \frac{4\pi}{3})$
- Find the rectangular equation by eliminating the parameter. State the domain and range and sketch the graph.

$x = 2 - 3\cos t$ $y = 3 - \sin t$
 $D(-\infty, \infty)$ $D(-\infty, \infty)$
 $R[-1, 5]$ $R[2, 4]$

$\frac{x-2}{-3} = \cos t$
 $\frac{y-3}{-1} = \sin t$


$$\frac{(x-2)^2}{9} + \frac{(y-3)^2}{1} = 1$$

$a=3$ $m(2, 3)$
 $b=1$

Apr 23-9:34 AM

GO COUGARS!



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In Exercises 13-20, plot the point given in polar coordinates and find the corresponding rectangular coordinates for the point.

13. $(4, -\frac{\pi}{3})$	14. $(-\frac{7\pi}{6})$
15. $(-1, -\frac{2\pi}{4})$	16. $(-3, -\frac{2\pi}{3})$
17. $(0, \frac{7\pi}{6})$	18. $(0, \frac{5\pi}{4})$

In Exercises 21-28, use a graphing utility to find the rectangular coordinates of the point given in polar coordinates. Round your results to two decimal places.

21. $(2, \frac{2\pi}{9})$	22. $(4, \frac{11\pi}{9})$
23. $(-4.5, 1.3)$	24. $(8.25, 3.5)$
25. $(2.5, 1.58)$	26. $(5.4, 2.85)$
27. $(-4.1, -0.5)$	28. $(8.2, -3.3)$

In Exercises 29-36, plot the point given in rectangular coordinates and find two sets of polar coordinates for the point for $0 \leq \theta < 2\pi$.

29. $(-7, 0)$	30. $(0, -5)$
31. $(1, 1)$	32. $(-3, -3)$
33. $(-\sqrt{3}, -\sqrt{3})$	34. $(\sqrt{3}, -1)$
35. $(6, 9)$	36. $(5, 12)$

In Exercises 37-42, use a graphing utility to find one set of polar coordinates for the point given in rectangular coordinates. (There are many correct answers.)

37. $(3, -2)$	38. $(-5, 2)$
39. $(\sqrt{3}, 2)$	40. $(3\sqrt{2}, 3\sqrt{2})$
41. $(\frac{1}{2}, \frac{1}{2})$	42. $(\frac{1}{2}, \frac{1}{2})$

In Exercises 43-60, convert the rectangular equation to polar form. Assume $a > 0$.

43. $x^2 + y^2 = 9$	44. $x^2 + y^2 = 16$
45. $y = 4$	46. $y = x$
47. $x = 8$	48. $x = a$
49. $3x - 6y + 2 = 0$	50. $4x + 7y - 2 = 0$
51. $xy = 4$	52. $2xy = 1$
53. $(x^2 + y^2) = 9(x^2 - y^2)$	54. $y^2 - 8x - 16 = 0$
55. $x^2 + y^2 - 6x = 0$	56. $x^2 + y^2 - 8y = 0$

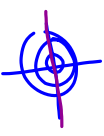
In Exercises 61-80, convert the polar equation to rectangular form.

61. $r = 6\sin\theta$	62. $r = 2\cos\theta$
63. $\theta = \frac{4\pi}{3}$	64. $\theta = \frac{2\pi}{3}$
65. $\theta = \frac{5\pi}{6}$	66. $\theta = \frac{11\pi}{6}$
67. $\theta = \frac{\pi}{2}$	68. $\theta = \pi$

$r^2 = 6r\cos\theta = 0$
 $\frac{r^2}{r} = \frac{6r\cos\theta}{r}$ $r = 6\cos\theta$

$\tan\theta = \tan\frac{\pi}{3}$
 $\frac{r\sin\theta}{r\cos\theta} = \frac{\sqrt{3}}{1}$
 $\frac{y}{x} = \sqrt{3}$
 $y = \sqrt{3}x$

$\tan\theta = \tan\frac{\pi}{2}$
 $\frac{\sin\theta}{\cos\theta} = \text{undefined}$
 $\rightarrow 0$
 $x = 0$



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Homework Questions

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In Exercises 23–36, sketch the graph of the polar equation. Use a graphing utility to verify your graph.

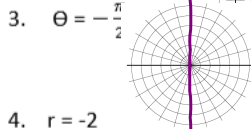
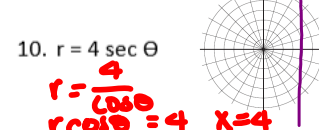
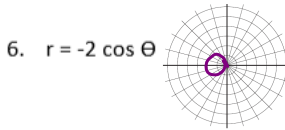
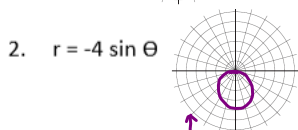
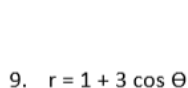
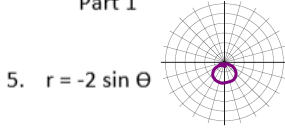
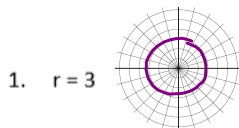
23. $r = 5$

24. $\theta = -\frac{5\pi}{3}$

25. $r = 3 \sin \theta$

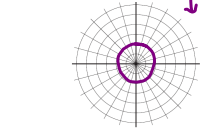
26. $r = 2 \cos \theta$

Part 1

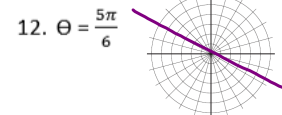


7. $r = 1 + 1 \sin \theta$

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



8. $r = 2 - 3 \cos \theta$



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Generalizations So Far!

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

2. $\theta = rad$ line through θ

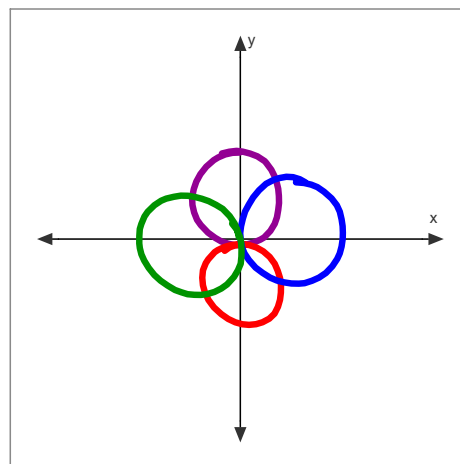
3. $r = 2a \sin \theta$

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

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

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

circle with radius of 'a'



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General Form of Polar Equations

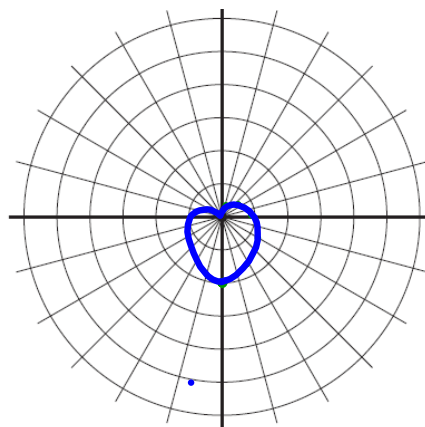
$$r = a \pm b \cos \theta \qquad r = a \pm b \sin \theta$$

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1. Cardioid $a = b$

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

θ	r
$\frac{3\pi}{2}$	2
$\frac{5\pi}{4}$	1.87
$\frac{3\pi}{4}$	1.5
0	1
$\frac{\pi}{2}$	$\frac{1}{2}$
$\frac{\pi}{4}$.13
$\frac{3\pi}{4}$	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 $|a|$

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

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

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

symmetry with trig axis

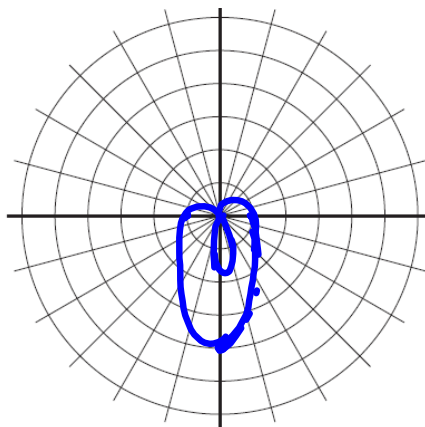
tip $|a| + |b|$ in direction of coefficient and trig function

sides $|a|$

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

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



Apr 26-8:58 AM

3. Dimpled Limacon $a > b$

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

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

symmetry with trig axis

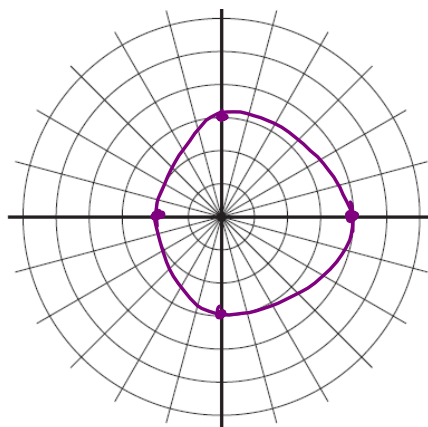
tip $|a| + |b|$ in direction of coefficient and trig function

sides $|a|$

dimple $|a| - |b|$ away from the tip (does not go through the pole)

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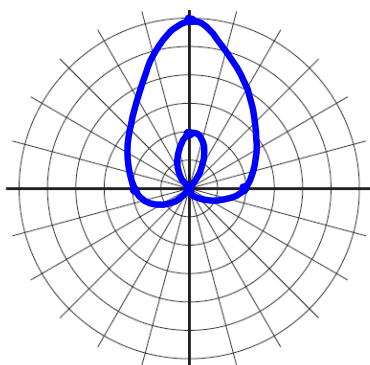
$$r = 3 + \cos \theta$$



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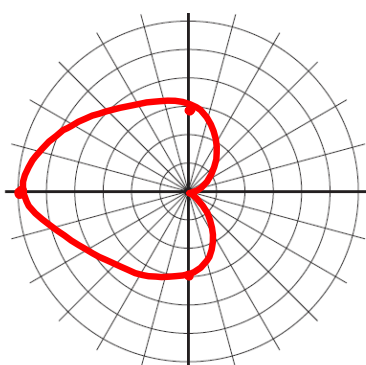
You try!!

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



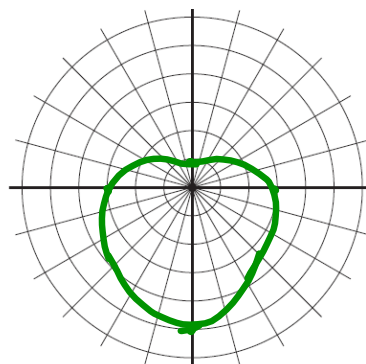
loopy limacon
tip: 6 ↑
side: 2
loop: 2

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



Cardioid
tip: ← 6
side: 3

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



dimpled limacon
tip: 5 ↓
side: 3
dimple: 1

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HOMEWORK



p720 #2-6 even, 7,8, 27-32

Packet pg 2 part 2 #1-12

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