

**GO COUGARS!**

**Homework Questions**

In Exercises 1-6, identify the type of polar graph.

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

3.  $r = 2 + 4 \cos \theta$       4.  $r = 2 + 4 \sin \theta$

5.  $r = 2 + 3 \cos \theta$       6.  $r = 2 + 3 \sin \theta$

Identify the Polar Function. In Exercises 7-10, determine the equation of the polar curve whose graph is shown.

7.      8.      9.      10.

In Exercises 11-36, sketch the graph of the polar equation. Use a graphing utility to verify your graph.

11.  $r = 3$       12.  $r = 3 \cos \theta$       13.  $r = 3 \sin \theta$       14.  $r = 4 \cos \theta$       15.  $r = 4 \sin \theta$       16.  $r = 2 \cos \theta$       17.  $r = 2 \sin \theta$       18.  $r = 4 - 3 \cos \theta$       19.  $r = 4 - 3 \sin \theta$       20.  $r = 1 - 2 \cos \theta$       21.  $r = 1 - 2 \sin \theta$       22.  $r = 4 + 3 \cos \theta$       23.  $r = 4 + 3 \sin \theta$       24.  $\theta = \frac{3\pi}{4}$       25.  $\theta = \frac{5\pi}{6}$       26.  $\theta = \frac{7\pi}{6}$       27.  $\theta = \frac{3\pi}{2}$       28.  $\theta = \frac{5\pi}{4}$       29.  $\theta = \frac{3\pi}{4}$       30.  $\theta = \frac{7\pi}{4}$       31.  $\theta = \frac{3\pi}{4}$       32.  $\theta = \frac{7\pi}{4}$

1.  $r = 1 - 2 \sin \theta$       5.  $r = 3 \sin \theta$       9.  $r = 3 + 3 \cos \theta$

2.  $r = 2 - 4 \cos \theta$       6.  $\theta = \frac{2\pi}{3}$       10.  $r = 4 \cos \theta$

3.  $r = 2 + 2 \sin \theta$       7.  $r = -3$       11.  $\theta = -\pi$

4.  $r = -2 \csc \theta$       8.  $r = 2 - \cos \theta$       12.  $r = 4 \sec \theta$

1.      5.      9.      10.

2.      6.      11.      12.

3.      7.      13.      14.

4.      8.      15.      16.

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### Chapter 10 Part 2 Review

Find the rectangular equation by eliminating the parameter. Sketch the graph and state the domain and range of the rectangular equation.

1.  $x = 3t + 2$   
 $y = t + 1$

2.  $x = t^2 + 4$   
 $y = t^2 - 4$

3.  $x = \sqrt{2}t$   
 $y = 4t$

4.  $x = 2 \cos t$   
 $y = 3 - 2 \sin t$

5.  $x = 1 - 2 \cos t$   
 $y = 2 + 5 \sin t$

6.  $x = 3 + \sec t$   
 $y = -2 + \tan t$

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10 part 2 Review.notebook

$$x = 3t + 2$$

$$y = t + 1$$

$$D_x (-\infty, \infty) \Rightarrow (-\infty, \infty)$$

$$D_y (-\infty, \infty)$$

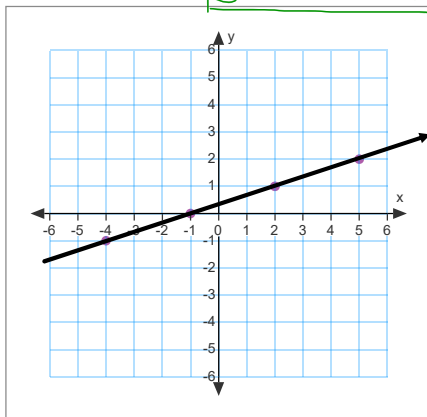
t	x	y
-2	-4	-1
-1	-1	0
0	2	1
1	5	2
2	8	3

$$\frac{x-2}{3} = t$$

$$y = \frac{x-2}{3} + 1$$

$$= \frac{1}{3}x - \frac{2}{3} + 1$$

$$y = \frac{1}{3}x + \frac{1}{3}$$



$$D (-\infty, \infty)$$

$$R (-\infty, \infty)$$

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$$x = t^2 + 4$$

$$y = t^2 - 4$$

$$D_x = (-\infty, \infty) \Rightarrow (-\infty, \infty)$$

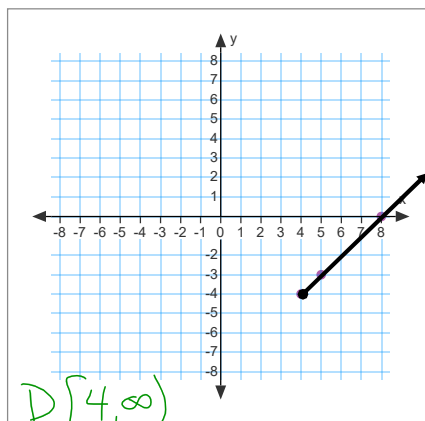
$$D_y (-\infty, \infty)$$

t	x	y
-2	8	0
-1	5	-3
0	4	-4
1	5	-3
2	8	0

$$x - 4 = t^2$$

$$y = x - 4 - 4$$

$$y = x - 8$$



$$D [4, \infty)$$

$$R [-4, \infty)$$

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10 part 2 Review.notebook

$x = \sqrt{2t}$   
 $y = 4t$

$D_x [0, \infty) \Rightarrow [0, \infty)$   
 $D_y (-\infty, \infty)$

t	x	y
0	0	0
2	2	8
8	4	32

$\frac{x^2}{2} = t$   
 $y = 4\left(\frac{x^2}{2}\right)$   
 $y = 2x^2$

$D [0, \infty)$   $R [0, \infty)$

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

$D_x (-\infty, \infty) \rightarrow (-\infty, \infty)$   
 $D_y (-\infty, \infty)$

t	x	y
0	2	3
$\frac{\pi}{2}$	0	1
$\pi$	-2	3
$\frac{3\pi}{2}$	0	5
$2\pi$	2	3

$\frac{x}{2} = \cos t$   
 $\left(\frac{x}{2}\right)^2 = \cos^2 t$   
 $\frac{y-3}{2} = \sin t$   
 $\left(\frac{y-3}{2}\right)^2 = \sin^2 t$

$\frac{x^2}{4} + \frac{(y-3)^2}{4} = 1$   
 $x^2 + (y-3)^2 = 4$

(same coeff. = circle!)

$D [-2, 2]$   $R [1, 5]$

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10 part 2 Review.notebook

$x = 1 - 2\cos t$   
 $y = 2 + 5\sin t$

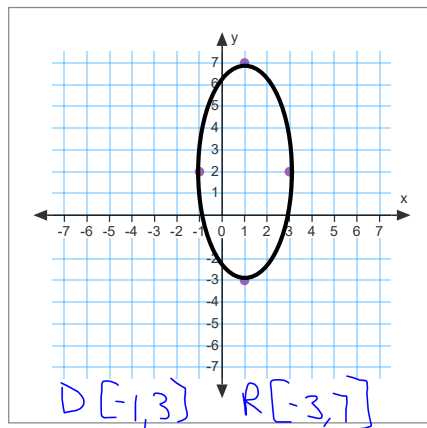
$D_x (-\infty, \infty) \Rightarrow (-\infty, \infty)$   
 $D_y (-\infty, \infty) \Rightarrow (-\infty, \infty)$

t	x	y
0	-1	2
$\frac{\pi}{2}$	1	7
$\pi$	3	2
$\frac{3\pi}{2}$	1	-3
$2\pi$	-1	2

$\frac{x-1}{-2} = \cos t$      $\frac{y-2}{5} = \sin t$   
 $\left(\frac{x-1}{-2}\right)^2 = \cos^2 t$      $\left(\frac{y-2}{5}\right)^2 = \sin^2 t$

$\frac{(x-1)^2}{4} + \frac{(y-2)^2}{25} = 1$

(different coeff  
= ellipse!)



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$x = 3 + \sec t$   
 $y = -2 + \tan t$

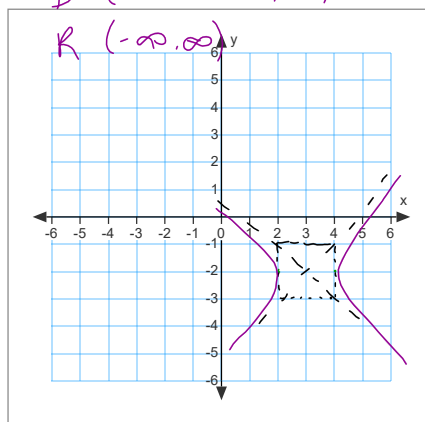
$D_x (-\infty, \infty) \quad t \neq \frac{k\pi}{2}, k \text{ is odd} \Rightarrow (-\infty, \infty) \quad k \neq \frac{k\pi}{2}$   
 $D_y (-\infty, \infty) \quad t \neq \frac{k\pi}{2}, k \text{ is odd} \Rightarrow (-\infty, \infty) \quad k \neq \frac{k\pi}{2}$   
 $R_x (-\infty, 2] \cup [4, \infty)$   
 $R_y (-\infty, \infty)$

t	x	y
0	4	-2
$\frac{\pi}{2}$	undefined	undefined
$\pi$	2	-2
$\frac{3\pi}{2}$	undefined	undefined
$2\pi$	4	-2

$(x-3)^2 = \sec^2 t$   
 $(y+2)^2 = \tan^2 t$   
 $(x-3)^2 - (y+2)^2 = 1$

$D (-\infty, 2] \cup [4, \infty)$

$R (-\infty, \infty)$



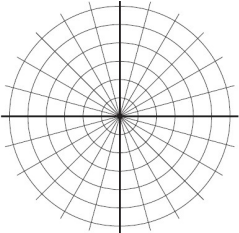
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10 part 2 Review.notebook

7. Plot the polar point and state 3 equivalent points with the following constraints.

$$\left(5, \frac{5\pi}{3}\right) \quad \begin{array}{l} r < 0, \quad 0 \leq \theta < 2\pi \\ r > 0, \quad -2\pi \leq \theta < 0 \\ r > 0, \quad 2\pi \leq \theta < 4\pi \end{array}$$

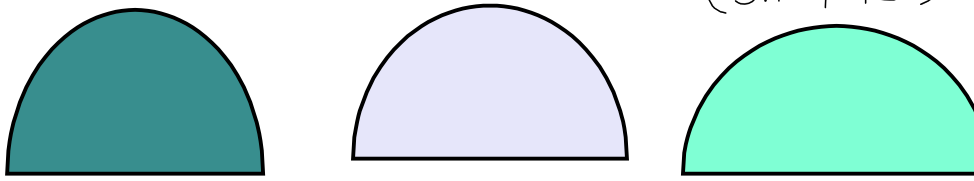
$(-5, \frac{2\pi}{3}) \quad (5, -\frac{\pi}{3}) \quad (5, \frac{11\pi}{3})$



8. Convert from polar coordinates to rectangular coordinates.

a)  $(6, 150^\circ)$       b)  $\left(-3, -\frac{3\pi}{4}\right)$       c)  $(-3.2, 185^\circ)$   
calc ok

$(-3\sqrt{3}, 3)$        $\left(\frac{3}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right)$        $(3.19, .28)$



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9. Find the polar coordinates for the following rectangular points. (in radians)

a)  $(-1, \sqrt{3})$

$$r = \sqrt{(-1)^2 + (\sqrt{3})^2}$$

$$r = 2$$

$$\tan \theta = \sqrt{3}$$

$$\theta = \frac{\pi}{3} \text{ (RA)}$$

QII  $\theta = \frac{2\pi}{3}$

$$\left(2, \frac{2\pi}{3}\right)$$

b)  $(4, 0)$

$$r = \sqrt{4^2 + 0^2}$$

$$= 4$$

$$\tan \theta = \frac{0}{4}$$

$$\theta = 0$$

$$(4, 0)$$

c)  $(-5, -7)$  (in degrees)

$$r = \sqrt{(-5)^2 + (-7)^2}$$

$$= \sqrt{74}$$

$$\tan \theta = \frac{7}{5}$$

$$\theta = 54.41 \text{ (RA)}$$

QIII  $\theta = 234.46$

$$\left(\sqrt{74}, 234.46^\circ\right)$$

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10 part 2 Review.notebook

10. Convert the rectangular equation to a polar equation.

a)  $2x^2 + 2y^2 = 5$

$$2(x^2 + y^2) = 5$$

$$x^2 + y^2 = \frac{5}{2}$$

$$r^2 = \frac{5}{2}$$

$$r = \sqrt{\frac{5}{2}}$$

b)  $2xy = 1$

$$2r \cos \theta r \sin \theta = 1$$

$$2r^2 \cos \theta \sin \theta = 1$$

$$r^2 = \frac{1}{2 \cos \theta \sin \theta}$$

$$r^2 = \frac{1}{2} \sec \theta \csc \theta$$

c)  $x = 12$

$$r \cos \theta = 12$$

$$r = \frac{12}{\cos \theta}$$

$$r = 12 \sec \theta$$

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11. Convert the polar equation to a rectangular equation.

a)  $r = -3 \sin \theta$

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

$$x^2 + y^2 = -3y$$

$$x^2 + \left(y^2 + 3y + \frac{3^2}{2^2}\right) = 0 + \frac{9}{4}$$

$$x^2 + \left(y + \frac{3}{2}\right)^2 = \frac{9}{4}$$

b)  $r = 2$

$$r^2 = 4$$

$$x^2 + y^2 = 4$$

c)  $\theta = \frac{4\pi}{3}$

$$\tan \theta = \tan \frac{4\pi}{3}$$

$$\frac{y}{x} = \sqrt{3}$$

$$y = \sqrt{3}x$$

d)  $r = \sin \theta - \cos \theta$

$$r^2 = r \sin \theta - r \cos \theta$$

$$x^2 + y^2 = y - x$$

$$\left(x^2 + x + \frac{1^2}{2^2}\right) +$$

$$\left(y^2 - y + \frac{1^2}{2^2}\right)$$

$$= \frac{1}{4} + \frac{1}{4}$$

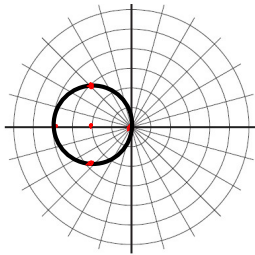
$$\left(x + \frac{1}{2}\right)^2 + \left(y - \frac{1}{2}\right)^2 = \frac{1}{2}$$

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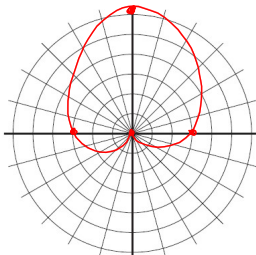
10 part 2 Review.notebook

Graph the polar equations.

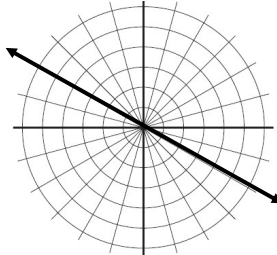
12.  $r = -4\cos\theta$



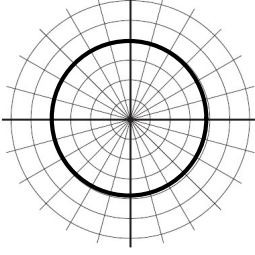
13.  $r = 3 + 3\sin\theta$



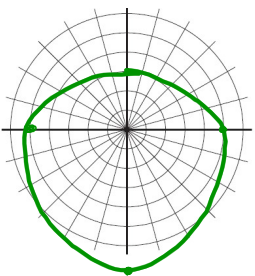
14.  $\theta = \frac{11\pi}{6}$



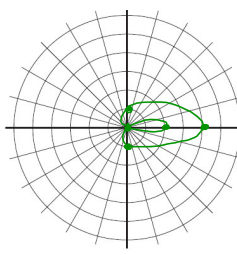
15.  $r = 3$



16.  $r = 5 - 2\sin\theta$



17.  $r = 1 + 3\cos\theta$



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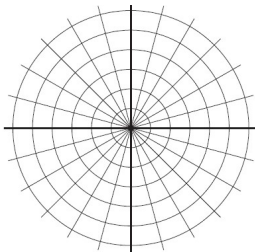
Additional Questions

1.  $x = t + 2$   
 $y = \sqrt{t}$
2.  $x = \sqrt{t} + 4$   
 $y = \sqrt{t} - 4$
3.  $x = 2\sin t$   
 $y = 1 + 2\cos t$
4.  $x = 5 + 3\cos t$   
 $y = 2 + \sin t$
5. Plot and state 3 equivalent points for  $\left(-3, \frac{7\pi}{6}\right)$ .
6. Convert to rectangular: #5 without calc and  $(2, 2.5)$  with calc.
7. Convert to polar:  $(-\sqrt{3}, 1)$ ,  $(1, -1)$ .
8. Convert to polar:  $xy = 2$   
 $2x - y = 3$   
 $y = -4$
9. Convert to rectangular:  $\theta = \frac{4\pi}{3}$   
 $r = 2$   
 $r = -2\sin\theta$

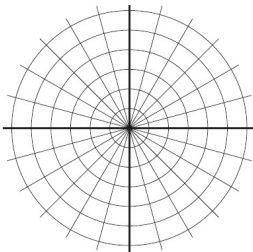
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## Graph the polar equations

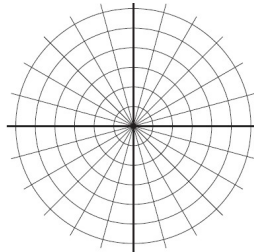
$$r = 3 \sin 5\theta$$



$$r = 4 \cos 4\theta$$



$$r^2 = 36 \sin 2\theta$$



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## HOMework

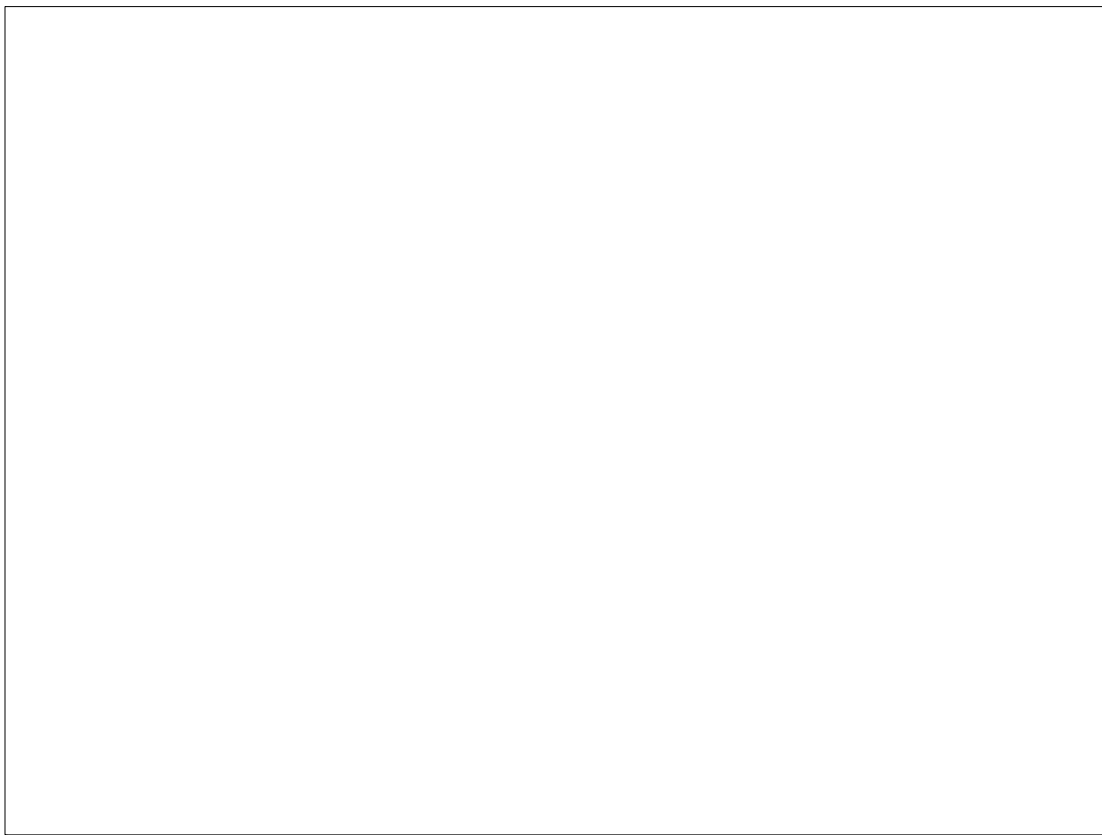


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all graphs by hand

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