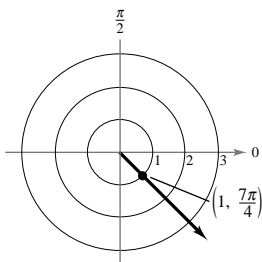
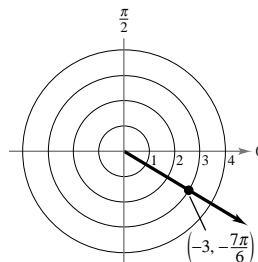


6.



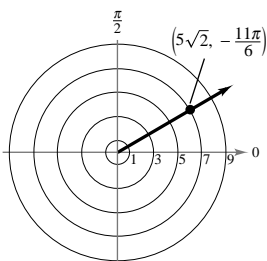
Three additional points: $\left(1, -\frac{\pi}{4}\right)$, $\left(-1, \frac{3\pi}{4}\right)$, $\left(-1, -\frac{5\pi}{4}\right)$

8.



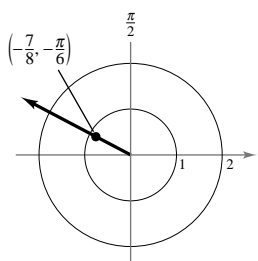
Three additional points: $\left(-3, \frac{5\pi}{6}\right)$, $\left(3, \frac{11\pi}{6}\right)$, $\left(3, -\frac{\pi}{6}\right)$

10.



Three additional points: $\left(5\sqrt{2}, \frac{\pi}{6}\right)$, $\left(-5\sqrt{2}, -\frac{5\pi}{6}\right)$, $\left(-5\sqrt{2}, \frac{7\pi}{6}\right)$

12.



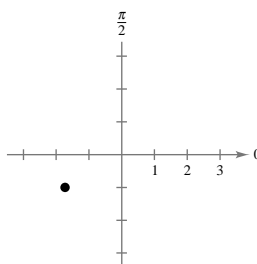
Three additional points: $\left(-\frac{7}{8}, \frac{11\pi}{6}\right)$, $\left(\frac{7}{8}, \frac{5\pi}{6}\right)$, $\left(\frac{7}{8}, -\frac{7\pi}{6}\right)$

 14. Polar coordinates: $\left(2, \frac{7\pi}{6}\right)$

$$x = 2 \cos \frac{7\pi}{6} = 2 \left(-\frac{\sqrt{3}}{2}\right) = -\sqrt{3}$$

$$y = 2 \sin \frac{7\pi}{6} = 2 \left(-\frac{1}{2}\right) = -1$$

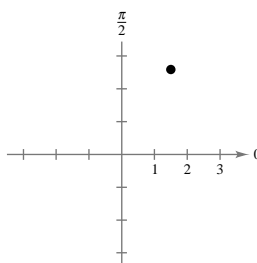
Rectangular coordinates: $(-\sqrt{3}, -1)$


 16. Polar coordinates: $\left(-3, -\frac{2\pi}{3}\right) = \left(3, \frac{\pi}{3}\right)$

$$x = -3 \cos \left(-\frac{2\pi}{3}\right) = -3 \left(-\frac{1}{2}\right) = \frac{3}{2}$$

$$y = -3 \sin \left(-\frac{2\pi}{3}\right) = -3 \left(-\frac{\sqrt{3}}{2}\right) = \frac{3\sqrt{3}}{2}$$

Rectangular coordinates: $\left(\frac{3}{2}, \frac{3\sqrt{3}}{2}\right)$

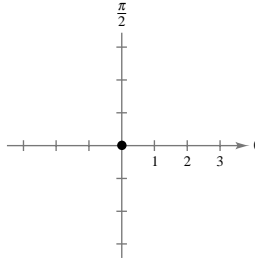


18. Polar coordinates: $\left(0, \frac{5\pi}{4}\right)$ (origin!)

$$x = 0 \cos \frac{5\pi}{4} = 0$$

$$y = 0 \sin \frac{5\pi}{4} = 0$$

Rectangular coordinates: $(0, 0)$

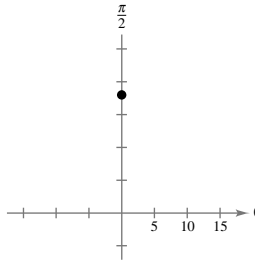


20. Polar coordinates: $\left(18, -\frac{3\pi}{2}\right)$

$$x = 18 \cos\left(-\frac{3\pi}{2}\right) = 0$$

$$y = 18 \sin\left(-\frac{3\pi}{2}\right) = 18$$

Rectangular coordinates: $(0, 18)$

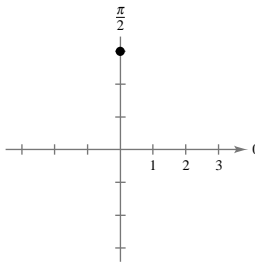


22. Polar coordinates: $(-3, -1.57)$

$$x = -3 \cos(-1.57) \approx -0.0024$$

$$y = -3 \sin(-1.57) \approx 3.000$$

Rectangular coordinates: $(-0.0024, 3)$



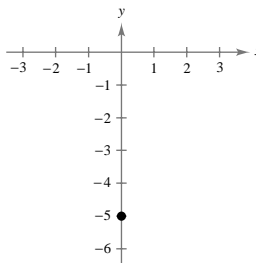
24. $(r, \theta) = \left(-2, \frac{7\pi}{6}\right) \Rightarrow (x, y) = (1.732, 1.0)$
 $= (\sqrt{3}, 1)$

26. $(r, \theta) = (8.25, 3.5) \Rightarrow (x, y) = (-7.726, -2.894)$

28. Rectangular coordinates: $(0, -5)$

$$r = 5, \tan \theta \text{ undefined}, \theta = \frac{\pi}{2}$$

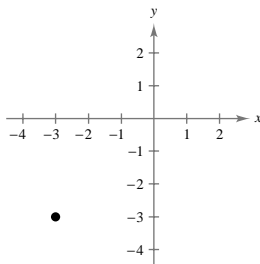
Polar coordinates: $\left(5, \frac{3\pi}{2}\right), \left(-5, \frac{\pi}{2}\right)$



30. Rectangular coordinates:
- $(-3, -3)$

$$r = 3\sqrt{2}, \tan \theta = 1, \theta = \frac{\pi}{4}$$

$$\text{Polar coordinates: } \left(3\sqrt{2}, \frac{5\pi}{4}\right), \left(-3\sqrt{2}, \frac{\pi}{4}\right)$$

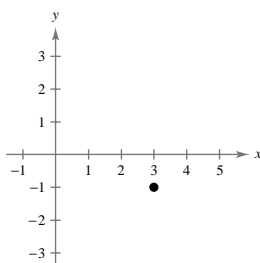


32. Rectangular coordinates:
- $(3, -1)$

$$r = \sqrt{9 + 1} = \sqrt{10},$$

$$\tan \theta = -\frac{1}{3}, \theta = \frac{\pi}{4}$$

$$\text{Polar coordinates: } \left(-\sqrt{10}, 2.820\right), \left(\sqrt{10}, 5.961\right)$$

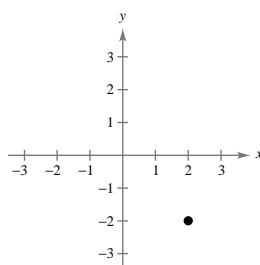


34. Rectangular coordinates:
- $(2, -2)$

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

$$\tan \theta = -1 \Rightarrow \theta = \frac{7\pi}{4}$$

$$\text{Polar coordinates: } \left(2\sqrt{2}, \frac{7\pi}{4}\right), \left(-2\sqrt{2}, \frac{3\pi}{4}\right)$$

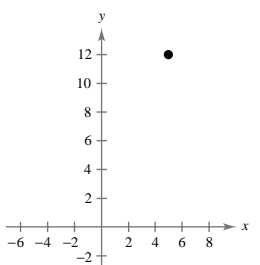


36. Rectangular coordinates:
- $(5, 12)$

$$r = \sqrt{25 + 144} = 13, \tan \theta = \frac{12}{5},$$

$$\theta \approx 1.176$$

$$\text{Polar coordinates: } (13, 1.176), (-13, 4.318)$$



- 38.
- $(x, y) = (-4, 1) \Rightarrow (r, \theta) = (4.123, 2.897)$

- 40.
- $(x, y) = (3\sqrt{2}, 3\sqrt{2}) \Rightarrow (r, \theta) = (6.0, 0.785)$

- 42.
- $(x, y) = \left(\frac{11}{4}, -\frac{5}{8}\right) \Rightarrow (r, \theta) = (2.8201, -0.2235)$

- 44.
- $(x, y) = (-8, 0) \Rightarrow (r, \theta) = (8, \pi) = (8, 3.1416)$

46. (a) $x^2 + y^2 - 6x = 0$

$r^2 - 6r \cos \theta = 0$

$r(r - 6 \cos \theta) = 0$

$r = 6 \cos \theta$

(b) $x^2 + y^2 - 8y = 0$

$r^2 - 8r \sin \theta = 0$

$r(r - 8 \sin \theta) = 0$

$r = 8 \sin \theta$

48. (a) $y = 4$

$r \sin \theta = 4$

$r = 4 \csc \theta$

(b) $y = b$

$r \sin \theta = b$

$r = b \csc \theta$

50. (a) $3x - 6y + 2 = 0$

$3r \cos \theta - 6r \sin \theta + 2 = 0$

$r(3 \cos \theta - 6 \sin \theta) = -2$

$r = \frac{-2}{3 \cos \theta - 6 \sin \theta}$

(b) $4x + 7y - 2 = 0$

$4r \cos \theta + 7r \sin \theta - 2 = 0$

$r(4 \cos \theta + 7 \sin \theta) = 2$

$r = \frac{2}{4 \cos \theta + 7 \sin \theta}$

52. (a) $y = x$

$r \sin \theta = r \cos \theta$

$\sin \theta = \cos \theta$

$\tan \theta = 1$

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

(b) $y^2 = 2x$

$(r \sin \theta)^2 = 2r \cos \theta$

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

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

54. (a) $(x^2 + y^2)^2 - 9(x^2 - y^2) = 0$

$(r^2)^2 - 9(r^2 \cos^2 \theta - r^2 \sin^2 \theta) = 0$

$r^2[r^2 - 9(\cos^2 \theta - \sin^2 \theta)] = 0$

$r^2[r^2 - 9 \cos 2\theta] = 0$

$r^2 = 9 \cos 2\theta$

(b) $y^2 - 8x - 16 = 0$

$r^2 \sin^2 \theta - 8r \cos \theta - 16 = 0$

$r^2(1 - \cos^2 \theta) - 8r \cos \theta - 16 = 0$

$r^2 \cos^2 \theta + 8r \cos \theta + 16 = r^2$

$(r \cos \theta + 4)^2 = r^2$

$r = \pm(r \cos \theta + 4)$

$r = \frac{4}{1 - \cos \theta} \quad \text{or} \quad r = \frac{-4}{1 + \cos \theta}$

56. $r = 4 \cos \theta$

$r^2 = 4r \cos \theta$

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

$x^2 + y^2 - 4x = 0$

58. $\theta = \frac{5\pi}{3}$

$\tan \theta = \tan \frac{5\pi}{3} = -\sqrt{3}$

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

$y + \sqrt{3}x = 0$

$$\begin{aligned}
 60. \quad r &= 10 \\
 r^2 &= 100 \\
 x^2 + y^2 &= 100
 \end{aligned}$$

$$\begin{aligned}
 62. \quad r &= 2 \sec \theta \\
 r \cos \theta &= 2 \\
 x &= 2
 \end{aligned}$$

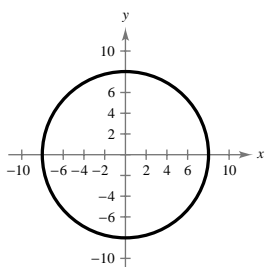
$$\begin{aligned}
 64. \quad r^2 &= \sin 2\theta = 2 \sin \theta \cos \theta \\
 r^2 &= 2 \left(\frac{y}{r}\right) \left(\frac{x}{r}\right) = \frac{2xy}{r^2} \\
 r^4 &= 2xy \\
 (x^2 + y^2)^2 &= 2xy
 \end{aligned}$$

$$\begin{aligned}
 66. \quad r &= 3 \cos 2\theta \\
 r &= 3(\cos^2 \theta - \sin^2 \theta) \\
 r^3 &= 3(r^2 \cos^2 \theta - r^2 \sin^2 \theta) \\
 (x^2 + y^2)^{3/2} &= 3(x^2 - y^2) \text{ or } (x^2 + y^2)^3 = 9(x^2 - y^2)^2
 \end{aligned}$$

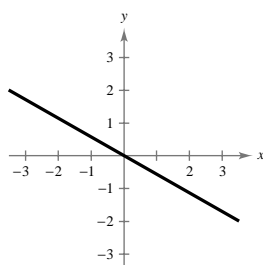
$$\begin{aligned}
 68. \quad r &= \frac{2}{1 + \sin \theta} \\
 r + r \sin \theta &= 2 \\
 \sqrt{x^2 + y^2} + y &= 2 \\
 x^2 + y^2 &= (2 - y)^2 \\
 x^2 + y^2 &= 4 - 4y + y^2 \\
 x^2 + 4y - 4 &= 0
 \end{aligned}$$

$$\begin{aligned}
 70. \quad r &= \frac{6}{2 \cos \theta - 3 \sin \theta} \\
 r &= \frac{6}{2(x/r) - 3(y/r)} \\
 r &= \frac{6r}{2x - 3y} \\
 1 &= \frac{6}{2x - 3y} \\
 2x - 3y &= 6
 \end{aligned}$$

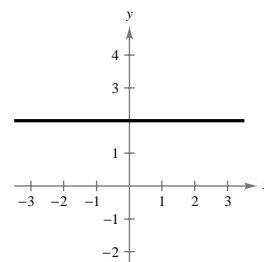
$$\begin{aligned}
 72. \quad r &= 8 \\
 r^2 &= 64 \\
 x^2 + y^2 &= 64
 \end{aligned}$$



$$\begin{aligned}
 74. \quad \theta &= \frac{5\pi}{6} \\
 \tan \theta &= \tan \frac{5\pi}{6} \\
 \frac{y}{x} &= -\frac{1}{\sqrt{3}} \\
 \sqrt{3}y &= -x \\
 x + \sqrt{3}y &= 0
 \end{aligned}$$



$$\begin{aligned}
 76. \quad r &= 2 \csc \theta \\
 r \sin \theta &= 2 \\
 y &= 2 \\
 y - 2 &= 0
 \end{aligned}$$



78. False. For instance when $r = 0$ any value of θ gives the same point.

80. (a) Horizontal movement: x -coordinate changes. Vertical movement: y -coordinate changes.
 (b) Horizontal movement: r and θ both change. Vertical movement: r and θ both change.
 (c) Unlike r and θ , x and y measure horizontal and vertical change, respectively.

82. By Cramer's Rule, $x = -\frac{5}{26}$, $y = \frac{55}{26}$.

84. By Cramer's Rule, $u = \frac{295}{89}$, $v = \frac{844}{89}$, $w = \frac{-672}{89}$.

86. $(x^2 - 3)^{10}$ $a = 153,090$

88. $(3x - 2y)^7$ $a = 15,120$