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LESSON 4-1

Circles

Practice and Problem Solving: C

Write the equation of each circle.

1. Center (9, –1) and radius $r = 7$

$(x-9)^2 + (y+1)^2 = 49$

2. Center (–5, –2) and containing the point (19, –9)

$(x+5)^2 + (y+2)^2 = 625$

3. Center (8, –3) and containing the point (–2, 21)

$(x-8)^2 + (y+3)^2 = 576$

4. Center (–5, 11) and containing the point (–17, 2)

$(x+5)^2 + (y-11)^2 = 225$

5. Center (0, –12) and radius $r = 10$

$x^2 + (y+12)^2 = 100$

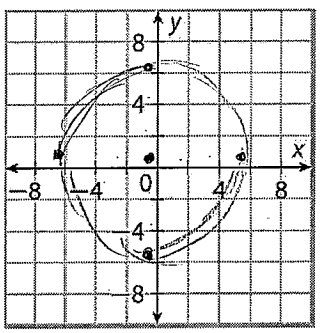
6. Center (7, 8) and radius $r = 3$

$(x-7)^2 + (y-8)^2 = 9$

Graph each circle by rewriting the equations in standard form.

7. $2x^2 + 2y^2 + 2x - 2y - 71 = 0$

$(x+\frac{1}{2})^2 + (y-\frac{1}{2})^2 = 36$

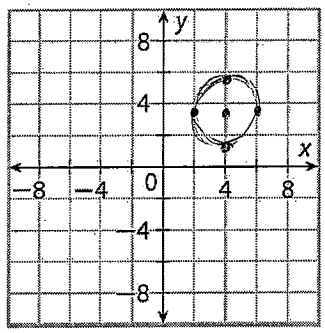


C(–½, ½)

r = 6

8. $4x^2 + 4y^2 - 32x - 28y + 97 = 0$

$(x-4)^2 + (y-3.5)^2 = 4$



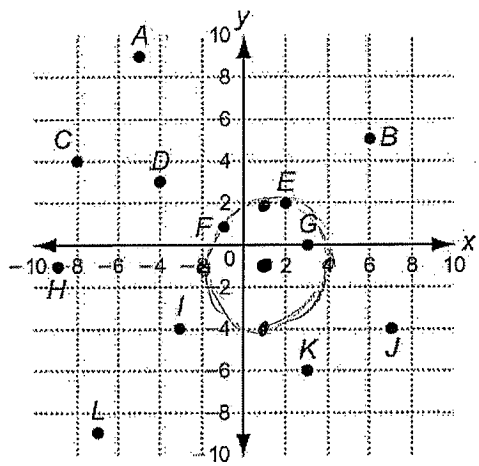
(4, 3.5)

r = 2

Solve.

9. An airport is located at the point (1, –1). The noise of planes landing and taking off can be heard up to 3 miles away. Use the equation of a circle to find the locations that are affected. Assume each unit of the coordinate plane represents 1 mile.

E, F, G



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LESSON 4-2

Parabolas

Practice and Problem Solving: C

Write the equation in standard form for each parabola.

1. Vertex (0, 0), directrix $y = 6$

$x^2 = -24y$

2. Vertex (0, 0), focus (5, 0)

$y^2 = 20x$

3. Vertex (0, 0), focus (10, 0)

$y^2 = 40x$

4. Vertex (0, 0), directrix $y = -4$

$x^2 = 16y$

5. Focus (–1, 0), directrix $x = 3$

$y^2 = -8(x-1)$

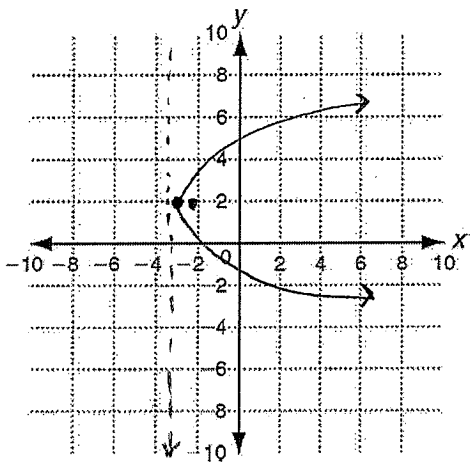
6. Vertex (4, 6), focus (4, –2)

$(x-4)^2 = -32(y-6)$

Find the vertex, value of *p*, axis of symmetry, focus, and directrix of each parabola. Then graph.

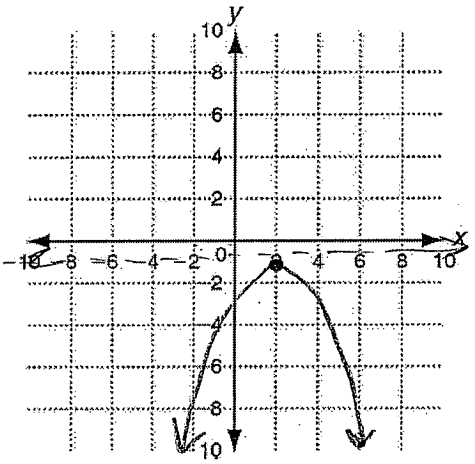
7. $x - 2 = \frac{1}{2}(y+3)^2$ $2(x-2) = (y+3)^2$

$V(-3,2)$ $p = \frac{1}{2}$ $F(-2.5,2)$ $x = -3.5$



8. $y + 1 = -(x-2)^2$

$V(2,-1)$ $p = \frac{1}{4}$ $F(2,-1.25)$ $y = -.75$



Solve.

9. A spotlight has parabolic cross sections.

   a. Write an equation for a cross section of the spotlight if the bulb is 15 centimeters from the vertex and the vertex is placed at the origin.

   $x^2 = 60y$

   b. If the spotlight has a diameter of 72 centimeters at its opening, find the depth of the spotlight if the bulb is 15 centimeters from the vertex.

   21.6 cm

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LESSON 4-3

Solving Linear-Quadratic Systems

Practice and Problem Solving: C

Solve each system. If necessary, use the Quadratic Formula.

1. $\begin{cases} y = -4x \\ x + 1 = \frac{1}{8}y^2 \end{cases}$

(1/2, -2) (-1, 4)

2. $\begin{cases} -x^2 + 4x + 15y - 92 = 0 \\ x - 2y = 3 \end{cases}$

no solution

3. $\begin{cases} \frac{y^2}{9} - \frac{x^2}{9} = 1 \\ 4y = 5x \end{cases}$

SKIP

4. $\begin{cases} 21x - 14y = 0 \\ \frac{3x^2}{16} + \frac{y^2}{6} = 1 \end{cases}$

SKIP

5. $\begin{cases} x - 2y = -1 \\ -6x^2 + 2y^2 + 3x + 11y = 62 \end{cases}$

no solution

6. $\begin{cases} x + y + 3 = 0 \\ -4x^2 + 5y^2 - 24x + 2y - 71 = 0 \end{cases}$

(4, -7) (-8, 5)

Jordon and Katherine are jogging on paths in a state park. Jordon's jogging path can be modeled by the equation $x + y = 25$. Katherine's jogging path can be modeled by the equation $\frac{y^2}{60^2} + \frac{x^2}{40^2} = 1$.

* use graphing calculator

Meanwhile, a ranger is driving through the park on a road modeled by the equation $y - 5(x - 30) = -70$. Use this information for Problems 7–9.

7. Will Jordon's and Katherine's paths intersect? If so, at what points? If not, explain your reasoning.

SKIP

8. Will the ranger cross paths with Katherine? If so, at what points? If not, explain your reasoning.

SKIP

9. Will the ranger cross paths with Jordon? If so, at what points? If not, explain your reasoning.

yes, (40.8, -15.8)

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LESSON 4-4

Solving Linear Systems in Three Variables

Practice and Problem Solving: A/B

Solve each system using substitution.

1. $\begin{cases} x+y+2z=-7 \\ -5z=25 \\ 3x-3y-6z=3 \end{cases}$

(-3, 6, -5)

2. $\begin{cases} 20x+20y=46 \\ 50x+20z=126 \\ 60x+10y+50z=263 \end{cases}$

(1, 1.3, 3.8)

Solve each system using elimination.

3. $\begin{cases} -r+6s-4t=17 \\ -4r-s-4t=7 \\ -r+s+5t=-15 \end{cases}$

(1, 1, -3)

4. $\begin{cases} 3r+2s+3t=-2 \\ -3r+s-2t=-1 \\ 6r+s+5t=-1 \end{cases}$

infinite

Solve each system using matrices.

5. $\begin{cases} -3b+c=15 \\ -2a+3b+2c=11 \\ -3a-4b+c=30 \end{cases}$ $\begin{bmatrix} 0 & -3 & 1 & 15 \\ -2 & 3 & 2 & 11 \\ -3 & -4 & 1 & 30 \end{bmatrix}$

(-4, -3, 6)

6. $\begin{cases} x+y+2z=9 \\ 3x-4y=16 \\ -3x-3y-6z=0 \end{cases}$ $\begin{bmatrix} 1 & 1 & 2 & 9 \\ 3 & -4 & 0 & 18 \\ -3 & -3 & -6 & 0 \end{bmatrix}$

$\begin{bmatrix} 1 & 0 & 1.1 & 0 \\ 0 & 1 & .86 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ no solution

Solve.

7. Steve is cashing in his jar of spare nickels, dimes, and quarters. When he gets to the bank, he receives a total of $14.70. He learns that he had 133 coins in all, and that there were 3 times as many dimes as quarters. How many of each type of coin did he save?

   a. Write a system of equations that models this situation.

   See answers

   b. Solve the system using any method. How many of each type of coin did Steve save?

   41 n, 109 d, 23 q