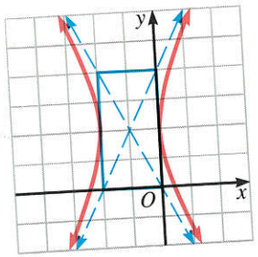
The given conic is to be translated so that its new center is at the given point. What will its new equation be?

3. $\frac{x^2}{25} + \frac{y^2}{4} = 1$; $(0, -5)$
4. $\frac{x^2}{16} - \frac{y^2}{1} = 1$; $(-5, 0)$
5. $x^2 - y^2 = 49$; $(-4, 3)$
6. $x^2 + y^2 = 9$; $(-1, 1)$
7. $4x^2 + y^2 = 16$; $(1, -4)$
8. $4x^2 - 9y^2 = 36$; $(3, -2)$

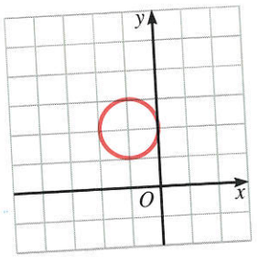
Match each equation with its graph.

9. $\frac{(x+1)^2}{1} + \frac{(y-2)^2}{4} = 1$
10. $\frac{(x+1)^2}{1} - \frac{(y-2)^2}{4} = 1$
11. $x + 1 = (y - 2)^2$
12. $(x + 1)^2 + (y - 2)^2 = 1$
13. $\frac{(y-2)^2}{1} - \frac{(x+1)^2}{4} = 1$
14. $\frac{(x+1)^2}{4} + \frac{(y-2)^2}{1} = 1$

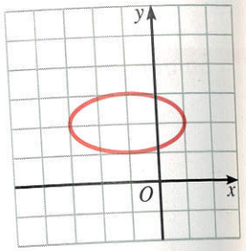
(a)



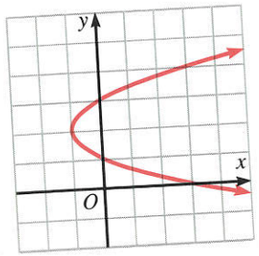
(b)



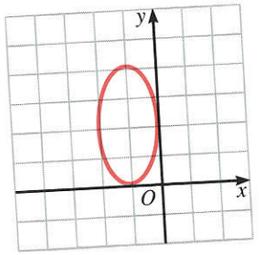
(c)



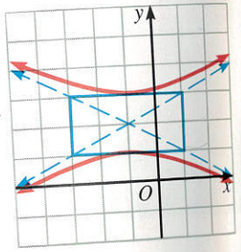
(d)



(e)



(f)



Written Exercises

Find an equation of the ellipse having the given foci and sum of focal radii.

A

1. $(6, 0)$, $(6, 6)$; 10
2. $(0, 0)$, $(0, 8)$; 12
3. $(-3, -3)$, $(-3, 3)$; 8
4. $(-5, 1)$, $(3, 1)$; 16
5. $(-2, -3)$, $(6, -3)$; 10
6. $(-10, 2)$, $(-2, 2)$; 14

Find an equation of the hyperbola having the given foci and difference of focal radii.

7. $(0, -2)$, $(8, -2)$; 2
8. $(0, 4)$, $(0, 10)$; 4
9. $(3, -8)$, $(3, -2)$; 4
10. $(-5, 3)$, $(9, 3)$; 6
11. $(5, -9)$, $(5, -1)$; 6
12. $(-4, -4)$, $(4, -4)$; 6

Identify each conic. Find its center and its foci (if any). Then draw its graph. You may wish to check your graphs on a computer or graphing calculator.

13. $x^2 - 4y^2 - 2x - 24y - 39 = 0$
14. $x^2 + 9y^2 + 2x - 18y + 1 = 0$
15. $x^2 + y^2 - 6x - 16y + 57 = 0$
16. $9x^2 - y^2 - 18x - 6y - 9 = 0$
17. $9x^2 + 25y^2 + 36x - 150y + 36 = 0$
18. $16x^2 - 9y^2 + 64x + 18y + 199$

B

19. Use the definition of an ellipse to find an equation of the ellipse having foci $(1, 1)$ and $(-1, -1)$ and sum of focal radii 3.
20. Use the definition of a hyperbola to find an equation of the hyperbola having foci $(-1, 1)$ and $(1, -1)$ and difference of focal radii 2.

C

21. Every conic section has an equation of the form

$$Ax^2 + By^2 + Cx + Dy + E = 0$$

where A and B are not both zero. Let $A = 1$, $C = 2$, $D = -8$, and $E = 1$. Graph the resulting quadratic equation in two variables for each given value of B. Then identify the graph.

a. $B = 0$ **b.** $B = 1$ **c.** $B = 4$ **d.** $B = -4$

e. Analyze the different equations you graphed in parts (a)–(d). What is the relationship between the coefficients A and B for which the general equation gives a circle? a parabola? an ellipse? a hyperbola?

Self-Test 2

Vocabulary

ellipse (p. 418)
focus (of an ellipse)(p. 418)
focal radii (of an ellipse) (p. 418)
symmetric about the x-axis (p. 419)
symmetric about the y-axis (p. 419)
symmetric about the origin (p. 419)
center (of an ellipse) (p. 419)
major axis (p. 419)
minor axis (p. 419)
hyperbola (p. 426)
focal radii (of a hyperbola) (p. 426)
asymptotes (p. 427)
central conic (p. 432)

1. Graph $16x^2 + 9y^2 = 144$. **Obj. 9-4, p. 418**
2. Find an equation of the ellipse having foci $(3, 0)$ and $(-3, 0)$ and sum of focal radii 8.
3. Graph $25y^2 - x^2 = 25$, showing the asymptotes as dashed lines. **Obj. 9-5, p. 426**
4. Find an equation of the hyperbola having foci $(0, 4)$ and $(0, -4)$ and difference of focal radii 4.
5. Identify and graph $4x^2 - 25y^2 - 24x + 50y - 89 = 0$. **Obj. 9-6, p. 432**
6. Find an equation of the ellipse having foci $(5, 2)$ and $(-5, 2)$ and sum of focal radii 12.

Check your answers with those at the back of the book.