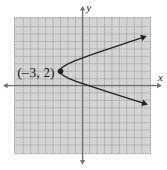
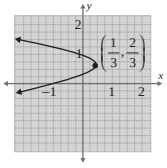
Margin Exercise Answers

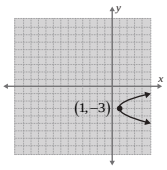
1. vertex: $(-3, 2)$ y-intercepts: $\left(0, 2-\sqrt{3}\right)$, $\left(0, 2+\sqrt{3}\right)$ line of symmetry: $y = 2$;



2. vertex: $\left(\frac{1}{3}, \frac{2}{3}\right)$; y-intercepts: $\left(0, \frac{1}{3}\right)$ and $(0, 1)$ line of symmetry: $y = \frac{2}{3}$



3.



y-intercepts: none

12.2 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. Four conic sections are the _____, _____, _____, and _____.

2. The basic form of a parabola that opens _____ or _____ is $x = ay^2$.

3. The equations of _____ parabolas can be written in the form $y = a(x - h)^2 + k$, where $a \neq 0$.

4. The equations of _____ parabolas can be written in the form $x = a(y - h)^2 + k$, where $a \neq 0$.

5. By setting $x =$ ____ and solving $0 = ay^2 + by + c$, we can determine the _____.

6. The vertex of a parabola is at the point _____.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. Not all parabolas are functions.

8. Parabolas open down if $a > 0$ and open up if $a < 0$.

9. The line $x = h$ is the line of symmetry for a horizontal parabola.

Practice

For the given equations, **a.** find the vertex, **b.** find the y-intercept, **c.** find the line of symmetry, and **d.** sketch the graph. See Examples 1 and 2.

1. $x = y^2 + 4$

2. $x = y^2 - 5$

3. $y + 3 = x^2$

4. $y - 2 = x^2$

5. $x = 2y^2 + 3$

6. $x = 3y^2 + 1$

7. $x = (y-3)^2$

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

9. $x - 4 = (y+2)^2$

10. $x + 3 = (y-5)^2$

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

12. $y - 5 = (x-3)^2$

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

14. $x = y^2 - 8y + 16$

15. $x = -y^2 + 10y - 25$

16. $x = -y^2 - 6y - 9$

17. $y = x^2 + 6x + 5$

18. $y = x^2 + 4x + 6$

19. $y = -x^2 - 4x + 5$

20. $y = -x^2 + 2x + 5$

21. $x = -y^2 + 4y - 3$

22. $x = y^2 + 8y + 12$

23. $y = 2x^2 + x - 1$

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

25. $x = -2y^2 + 5y - 2$

26. $x = 3y^2 + 5y + 2$

27. $x = 3y^2 + 6y - 5$

28. $x = 4y^2 - 4y - 15$

29. $y = 4x^2 - 12x + 9$

30. $y = -5x^2 + 10x + 2$

Use a graphing calculator to graph each of the parabolas. Use the trace and zoom features of the calculator to estimate the *y*-intercepts of the parabola. See Example 3. (See Section 4.5 to review the trace and zoom features on a TI-84 Plus graphing calculator.)

31. $x = 2y^2 - 3$

32. $x = -3y^2 + 1$

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

34. $x = y^2 - 5y$

35. $x = 2y^2 + y + 1$

36. $x = -y^2 - 4y + 1$

37. $x = 4y^2 + 8y - 7$

38. $x = 3y^2 + 3y + 2$

39. $x = -2y^2 + 4y + 3$

40. $x = -5y^2 - 10y - 4$

Use your knowledge of parabolas and equations to match the equation with the graph.

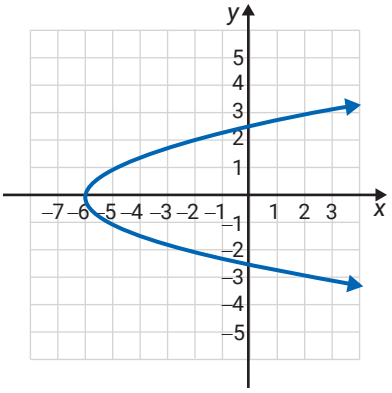
41. $x = 2(y-3)^2 + 3$

42. $x = -(y+1)^2 + 5$

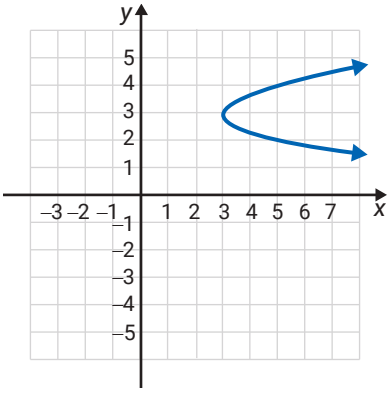
43. $x = -y^2 - 1$

44. $x = y^2 - 6$

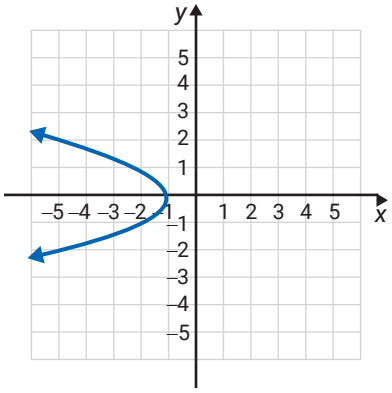
a.



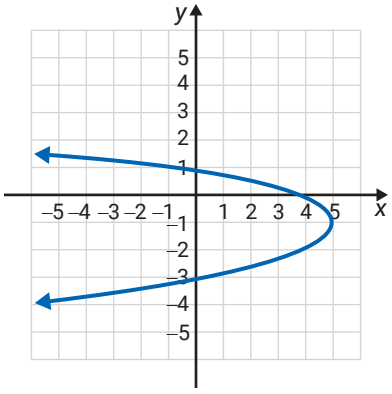
b.



c.



d.



Writing & Thinking

45. For $x = ay^2 + by + c$ we know that the graph of the parabola opens to the right if $a > 0$ and to the left if $a < 0$. Discuss which values of a will cause the parabola to be wider and which will cause it to be narrower than the graph of $x = y^2$.