Answers for 10.1

For use with pages 632–634

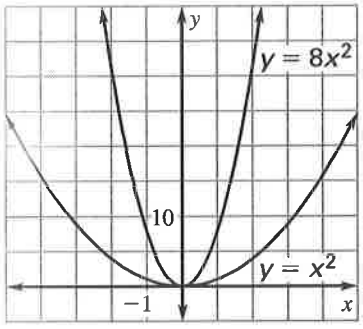
10.1 Skill Practice

1. parabola

2. The graph of the quadratic function $y = ax^2 + bx + c$ opens up if $a > 0$ and opens down if $a < 0$.

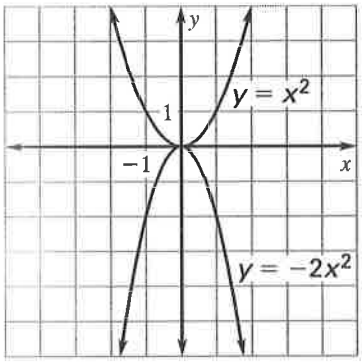
3. C **4.** A **5.** B

6.



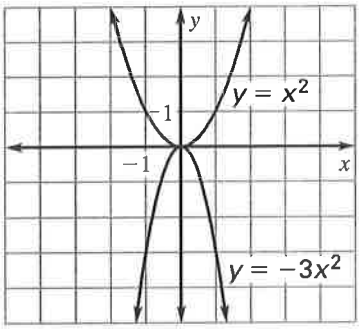
The graph is a vertical stretch (by a factor of 8) of the graph of $y = x^2$.

7.



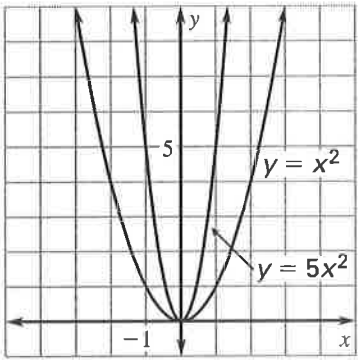
The graph is a vertical stretch (by a factor of 2) with a reflection in the x-axis of the graph of $y = x^2$.

8.



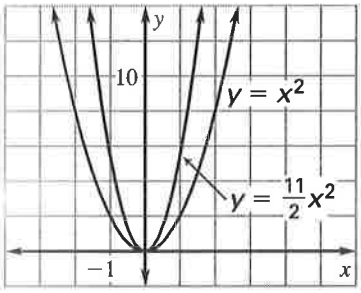
The graph is a vertical stretch (by a factor of 3) with a reflection in the x-axis of the graph of $y = x^2$.

9.



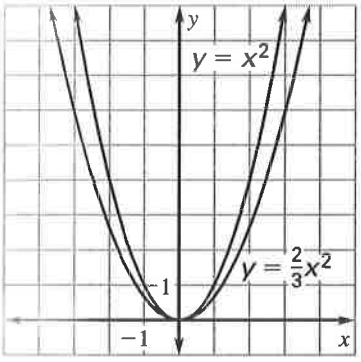
The graph is a vertical stretch (by a factor of 5) of the graph of $y = x^2$.

10.



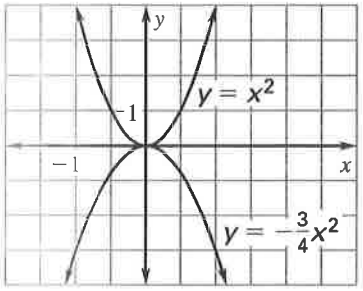
The graph is a vertical stretch $\left(\text{by a factor of } \frac{11}{2}\right)$ of the graph of $y = x^2$.

11.



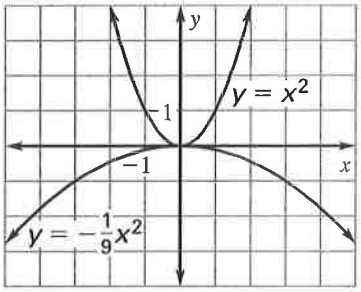
The graph is a vertical shrink $\left(\text{by a factor of } \frac{2}{3}\right)$ of the graph of $y = x^2$.

12.



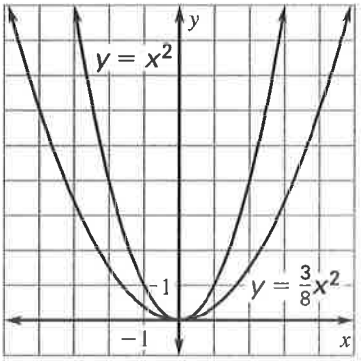
The graph is a vertical shrink $\left(\text{by a factor of } \frac{3}{4}\right)$ with a reflection in the x-axis of the graph of $y = x^2$.

13.



The graph is a vertical shrink $\left(\text{by a factor of } \frac{1}{9}\right)$ with a reflection in the x-axis of the graph $y = x^2$.

14.

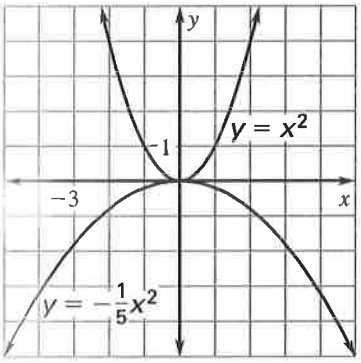


The graph is a vertical shrink $\left(\text{by a factor of } \frac{3}{8}\right)$ of the graph of $y = x^2$.

Answers for 10.1 *continued*

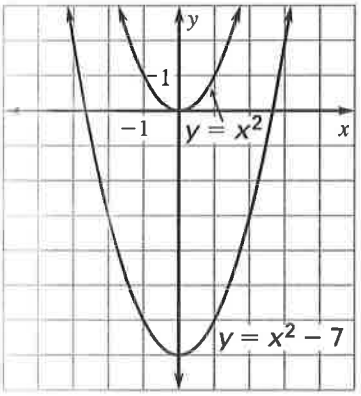
For use with pages 632–634

15.



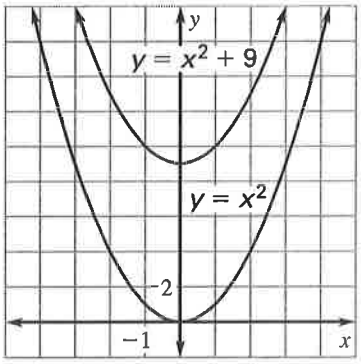
The graph is a vertical shrink $\left(\text{by a factor of } \frac{1}{5}\right)$ with a reflection in the x-axis of the graph of $y = x^2$.

16.



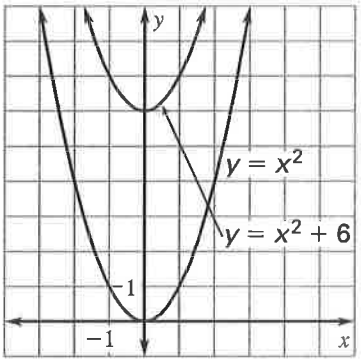
The graph is a vertical translation (of 7 units down) of the graph of $y = x^2$.

17.



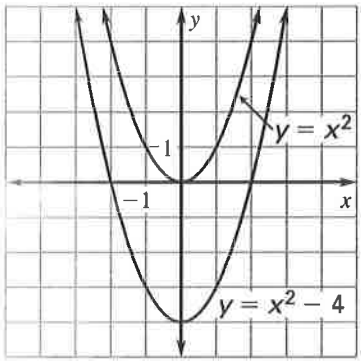
The graph is a vertical translation (of 9 units up) of the graph of $y = x^2$.

18.



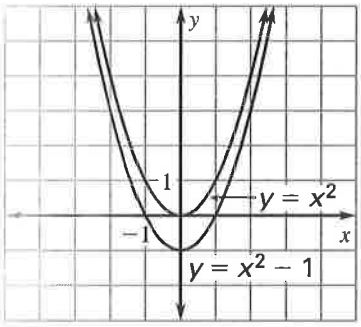
The graph is a vertical translation (of 6 units up) of the graph of $y = x^2$.

19.



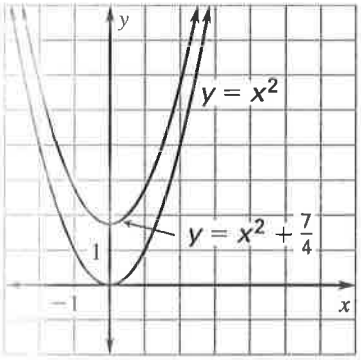
The graph is a vertical translation (of 4 units down) of the graph of $y = x^2$.

20.



The graph is a vertical translation (of 1 unit down) of the graph of $y = x^2$.

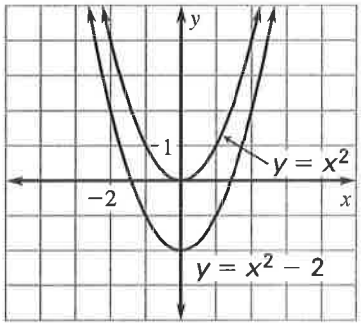
21.



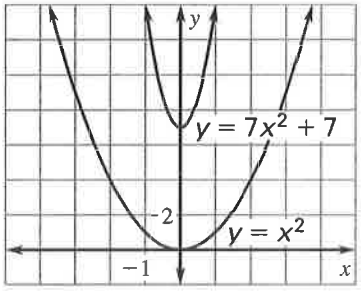
The graph is a vertical translation $\left(\text{of } \frac{7}{4} \text{ units up}\right)$ of the graph of $y = x^2$.

22. C

23. The graph of $y = x^2 - 2$ should be shifted 2 units down, not 2 units up. The vertex should be at $(0, -2)$.

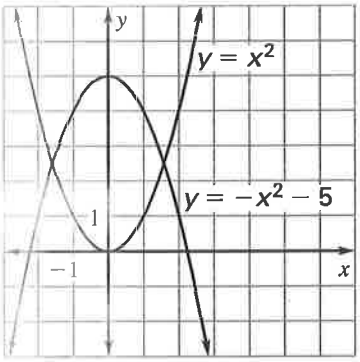


24.



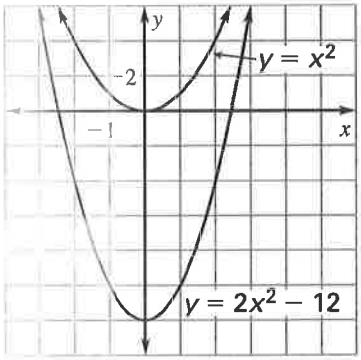
The graph is a vertical stretch (by a factor of 7) with a vertical translation (of 7 units up) of the graph of $y = x^2$.

25.



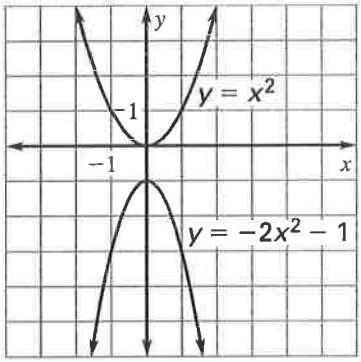
The graph is a reflection in the x-axis with a vertical translation (of 5 units up) of the graph of $y = x^2$.

26.



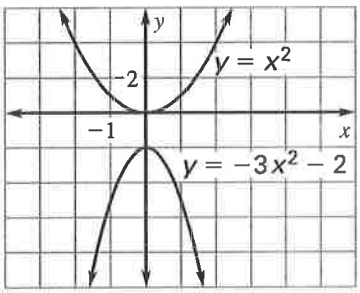
The graph is a vertical stretch (by a factor of 2) with a vertical translation (of 12 units down) of the graph of $y = x^2$.

27.



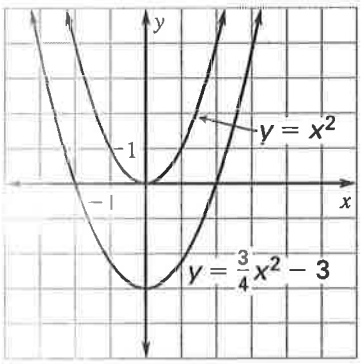
The graph is a vertical stretch (by a factor of 2) with a vertical translation (of 1 unit down) and a reflection in the x-axis of the graph of $y = x^2$.

28.



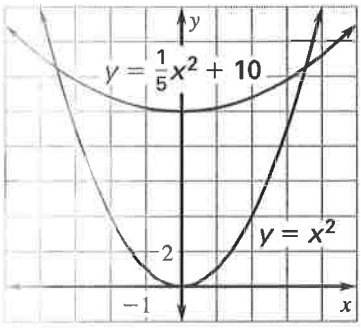
The graph is a vertical stretch (by a factor of 3) with a vertical translation (of 2 units down) and a reflection in the x-axis of the graph of $y = x^2$.

29.



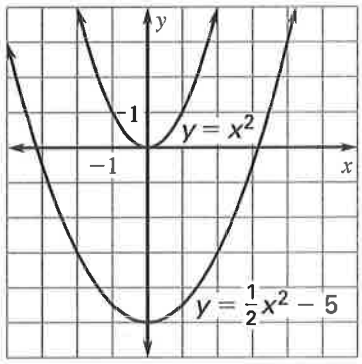
The graph is a vertical shrink $\left(\text{by a factor of } \frac{3}{4}\right)$ with a vertical translation (of 3 units down) of the graph of $y = x^2$.

30.



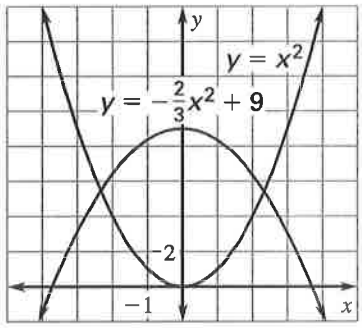
The graph is a vertical shrink $\left(\text{by a factor of } \frac{1}{5}\right)$ with a vertical translation (of 10 units up) of the graph of $y = x^2$.

31.



The graph is a vertical shrink $\left(\text{by a factor of } \frac{1}{2}\right)$ with a vertical translation (of 5 units down) of the graph of $y = x^2$.

32.



The graph is a vertical shrink $\left(\text{by a factor of } \frac{2}{3}\right)$ with a vertical translation (of 9 units up) and a reflection in the x-axis of the graph of $y = x^2$.

33. B

34. Translate the graph of f 13 units up.

35. Translate the graph of f 5 units down.

36. Shrink the graph of f by a factor of $\frac{1}{2}$.

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

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

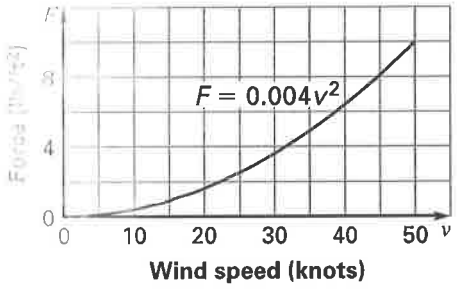
39. $y = -7x^2 + 11.5$

10.1 Problem Solving

40. a. $-32 \le x \le 32$

b. $0 \le y \le 12.288$

41. a.



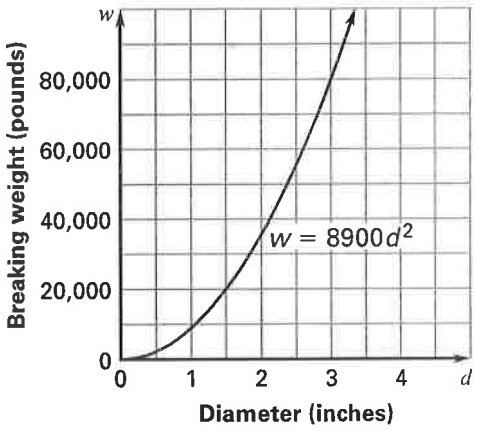
b. about 16 knots

c. about 35 knots

42. a. $h = -16t^2 + 45$, $h = -16t^2 + 32$

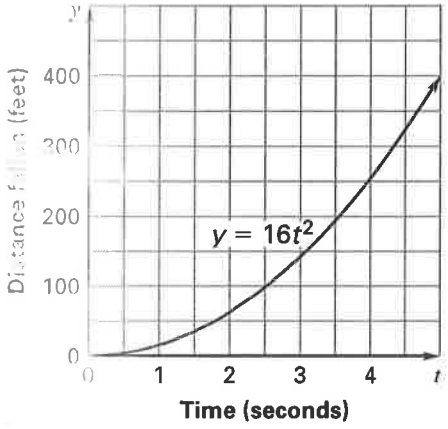
b. *Sample answer:* The graph of $h = -16t^2 + 45$ is a vertical translation (of 13 units up) of the graph of $h = -16t^2 + 32$.

43. a.

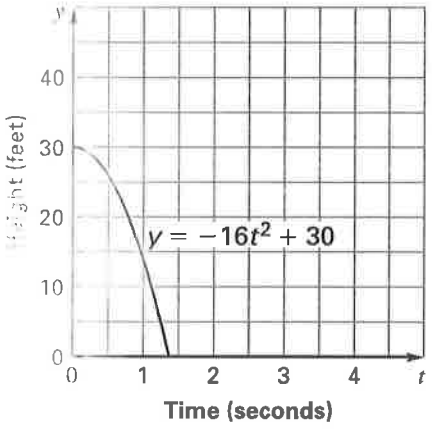


b. No. *Sample answer:* Let D be the diameter of a rope with 4 times the breaking weight of a rope with breaking weight d. Then $8900D^2 = 4(8900d^2)$; $D^2 = 4d^2$; $D = \sqrt{4d^2}$; $D = 2d$. Thus, the diameter of the rope with 4 times the breaking weight is only two times the diameter of the other rope.

44. a.

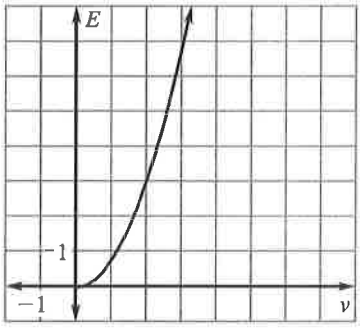


b.



c. The graph of $y = -16t^2 + 30$ is a reflection in the x-axis and a vertical translation (of 30 units up) of the graph of $y = 16t^2$. To use the graph of $y = -16t^2 + 30$, estimate the t-value of the point that has a y-value of 20 feet, which is the height of the egg after it falls 10 feet. To use the graph of $y = 16t^2$, estimate the t-value of the point that has a y-value of 10 feet.

45. $E = 0.75v^2$



10.1 Mixed Review

46. 9 **47.** 1 **48.** 91

49. 511 **50.** 12 **51.** 41

52. $\left(1\frac{1}{7}, 6\frac{2}{7}\right)$ **53.** (9, 8)

54. (15, 1)

55. $2p^2 + 7p + 6$

56. $21x^2 + 8x - 5$

57. $25n^2 - 95n + 90$

Answers for 10.2

For use with pages 638–640

10.2 Skill Practice

1. When the function is in standard form, $y = ax^2 + bx + c$, it will have a minimum value if $a > 0$ and a maximum value if $a < 0$.

2. Use the sign of a to tell if the parabola opens up or down. Find the axis of symmetry, $x = -\frac{b}{2a}$, which also gives the x-coordinate of the vertex. Substitute $-\frac{b}{2a}$ for x in the function to find the y-coordinate of the vertex. Calculate y-values for two x-values on one side of the vertex. Plot the vertex and the two points; then reflect the two points through the axis of symmetry to locate two more points. Draw a parabola through the plotted points.

3. $x = 2, (2, -2)$

4. $x = 3, (3, 2)$

5. $x = 4, (4, 26)$

6. $x = -5, (-5, 25)$

7. $x = -\frac{1}{2}, \left(-\frac{1}{2}, -\frac{3}{2}\right)$

8. $x = 0, (0, 7)$

9. $x = 0, (0, -1)$

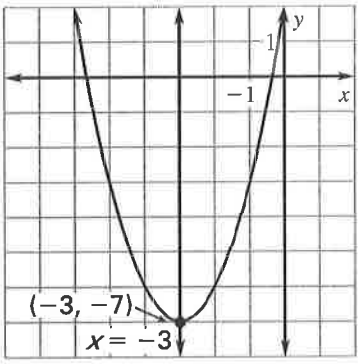
10. $x = -8, (-8, -41)$

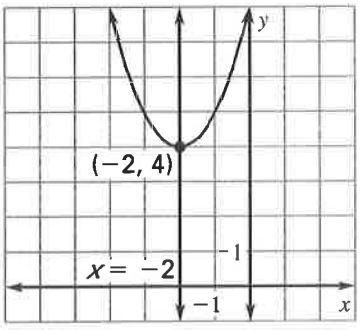
11. $x = 6, (6, 7)$

12. D

13. The equation of the axis of symmetry is $x = -\frac{b}{2a}$, not $x = \frac{b}{2a}$; $x = -\frac{b}{2a} = -\frac{16}{2(2)}$, $x = -4$.

14. $-\frac{3}{2}$ should be substituted for a; $x = -\frac{18}{2\left(-\frac{3}{2}\right)}$, $x = 6$.

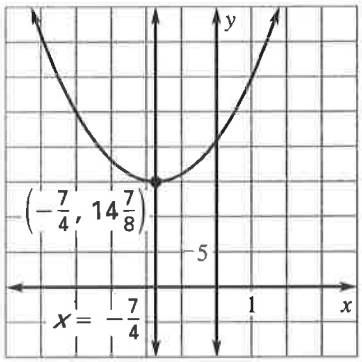
15. 

16. 

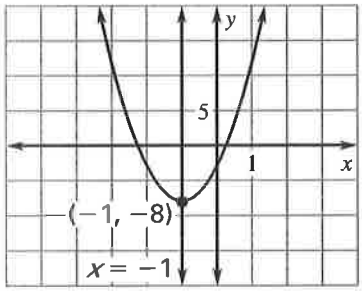
Answers for 10.2 *continued*

For use with pages 638–640

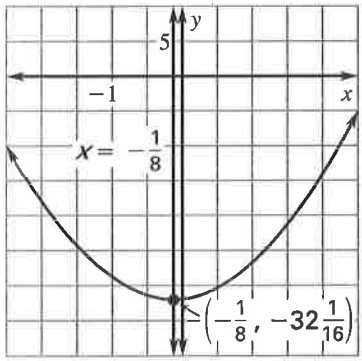
17.



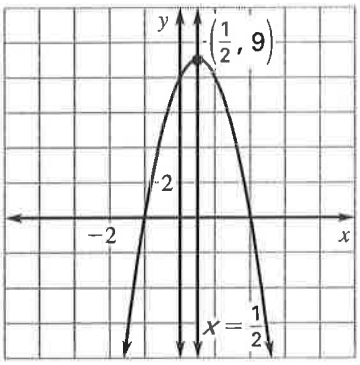
18.



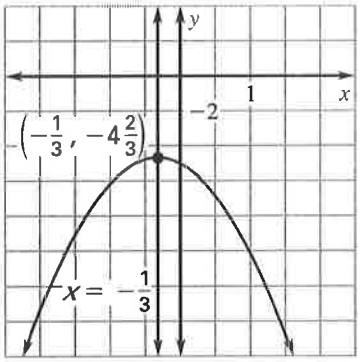
19.



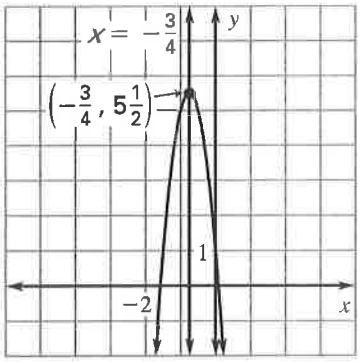
20.



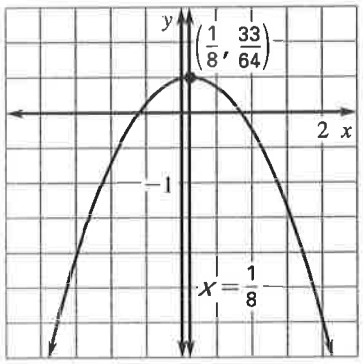
21.



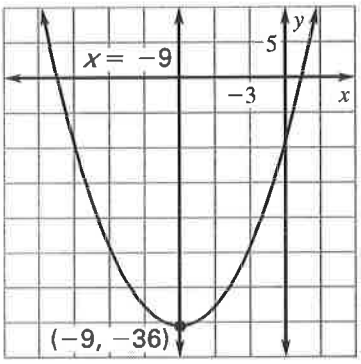
22.



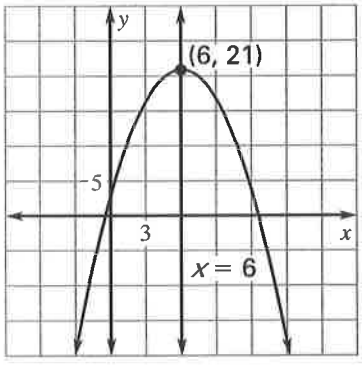
23.



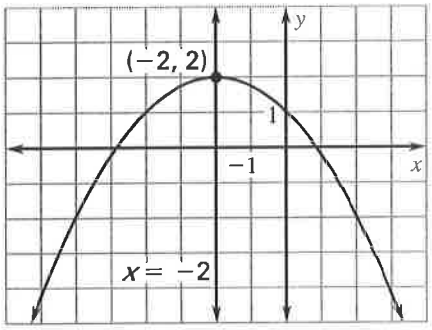
24.



25.



26.



27. B

28. minimum value; -6

29. maximum value; 7

30. minimum value; -64

31. maximum value; -8

32. minimum value; $-\frac{17}{4}$

33. maximum value; $\frac{81}{8}$

34. minimum value; 3

35. maximum value; 54

36. minimum value; -38

37. The graph of $y = x^2 + 4 = x + 1$ is a horizontal translation (of 4 units left) of the graph $y = x^2 - 4x + 1$.

38. **a.** $0, -\frac{b}{a}$

b. $-\frac{b}{2a}; x = -\frac{b}{2a}$

39. *Sample answer:* $y = -2x^2 + 8x$

10.2 Problem Solving

40. about 0.091 sec; about 80 mm

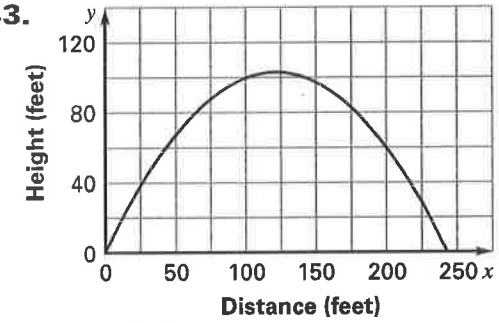
41. about 66 feet

42. a. $R = -10n^2 + 100n + 750$

b. \$1000

c. \$10; the maximum value of \$1000 occurs when $n = 5$, so the students should charge 5 \$1 increases, or \$5 + \$5 = \$10 in order to generate the most sales revenue.

43.



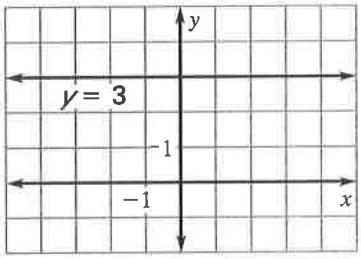
about 243 feet

44. No; the maximum value of the function $S = 332 + 132t - 10.4t^2$ occurs when $t = -\frac{132}{2(-10.4)} \approx 6.35$. Because the function S makes sense only for integer values of t, the maximum value of S occurs at either $t = 6$ or $t = 7$. These t-values correspond to 1996 and 1997, so the greatest number of tickets for Broadway tours was sold after 1995.

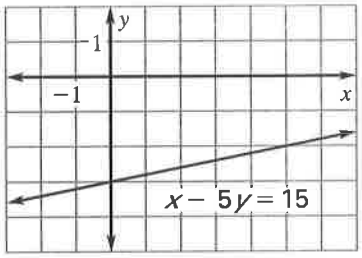
45. $y = -0.00031x^2 + 0.011x + 1.5$

10.2 Mixed Review

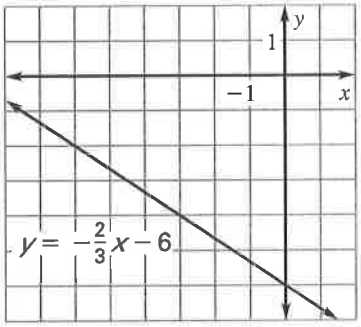
46.



47.



48.



49. $6x - 21$

50. $2 - 7a$

51. $-3y + 1$

52. $16m^4n^4$

53. $245w^{14}$

54. $\frac{u^4v}{6}$

55. $-3, 7$

56. $-6, -4$

57. $-3, -\frac{3}{5}$

58. $-3, 1$