Quick Review 12.4

1. $f(2)=3(2)^2-4=3\cdot4-4=12-4=8$

2. $-f(2)=-\left(3(2)^2-4\right)=-(3\cdot4-4)=-(12-4)=-8$

3. $f(-2)=3(-2)^2-4=3\cdot4-4=12-4=8$

4. $f(0)=3(0)^2-4=3\cdot0-4=-4$

5. $-f(0)=-\left(3(0)^2-4\right)=-(3\cdot0-4)=-(-4)=4$

Exercises 12.4

1. The graph of the absolute value function $f(x)=|x|$ is given in choice **G**.

3. The graph of the linear function $f(x)=x$ is given in choice **B**.

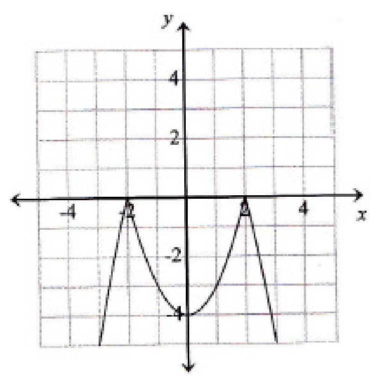
5. The graph of the square root function $f(x)=\sqrt{x}$ is given in choice **E**.

7. The graph of the cubic function $f(x)=x^3$ is given in choice **D**.

9.

x	$f(x)$	$-f(x)$
0	4	−4
1	2	−2
2	2	−2
3	4	−4
4	6	−6

11.



13. The graph of the scaled function $f(x)=2x^2$ can be found by vertically stretching the graph of $y=x^2$ by a factor of 2. Thus the answer is **B**.

15. The graph of the scaled function $f(x)=\frac{1}{2}x^2$ can be found by vertically shrinking the graph of $y=x^2$ by a factor of 1/2. Thus the answer is **A**.

17. The graph of the linear function $f(x)=5x$ is the graph that has the greatest positive slope. Thus the answer is **D**.

19. The graph of the linear function $f(x)=-2x$ is the graph that has the greatest negative slope. Thus the answer is **A**.

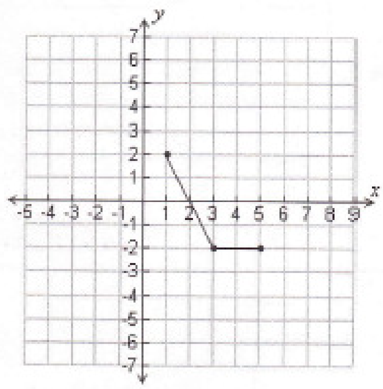
21. The graph of the scaled function $f(x)=\frac{3}{4}|x|$ can be found by vertically shrinking the graph of $y=|x|$ by a factor of $3/4$. Thus the answer is **D**.

23. The graph of the scaled function $f(x)=\frac{3}{2}|x|$ can be found by vertically stretching the graph of $y=|x|$ by a factor of $3/2$. Thus the answer is **A**. (Note that the graph in **B** is stretched more than the graph in **A**.)

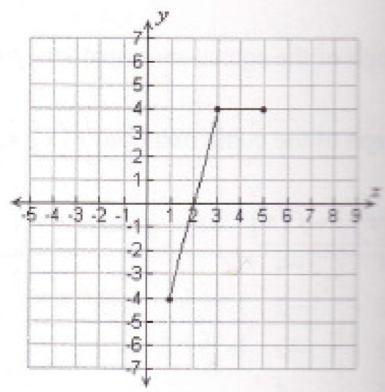
25. The graph of the scaled function $f(x)=4\sqrt{x}$ can be found by vertically stretching the graph of $y=\sqrt{x}$ by a factor of 4. Thus the answer is **B**.

27. The graph of the scaled function $f(x)=\frac{3}{4}\sqrt{x}$ can be found by vertically shrinking the graph of $y=\sqrt{x}$ by a factor of $3/4$. Thus the answer is **A**. (Note that the graph in **C** is compressed more than the graph in **A**.)

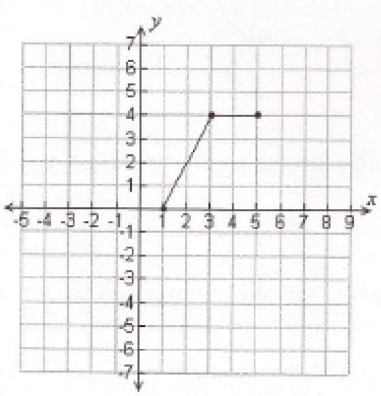
29. The graph of $y=-f(x)$ is the graph of $y=f(x)$ reflected across the x-axis.



31. The graph of $y=2f(x)$ is obtained by vertically stretching the graph of $y=f(x)$ by a factor of 2.



33. The graph of $y=f(x)+2$ is the graph of $y=f(x)$ shifted up two units.



35.

x	$-f(x)$
-2	-18
-1	-9
0	-3
1	-1
2	-3

37.

x	$2f(x)$
-2	$2(18)=36$
-1	$2(9)=18$
0	$2(3)=6$
1	$2(1)=2$
2	$2(3)=6$

39. For each value of x, $y_2=\frac{1}{2}y_1$. Thus $y_2=\frac{1}{2}f(x)$.

41. For each value of x, $y_2=-\frac{1}{4}y_1$. Thus $y_2=-\frac{1}{4}f(x)$.

45. For the same y value in y_1 and y_2, the x-value is 3 units less for y_2 than for y_1. Thus the equation for y_2 is $y_2 = f(x+3)$.

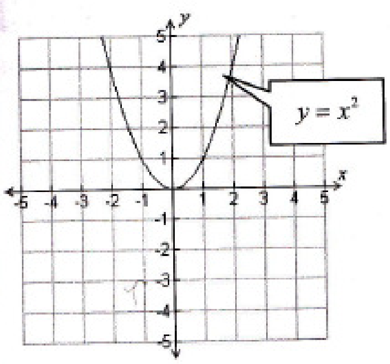
47. The graph of $f(x) = 8x^2$ is obtained by vertically stretching the graph of $f(x) = x^2$ by a factor of 8. The location of the vertex $(0, 0)$ will not change.

49. The graph of $f(x) = 8x^2 - 7$ is obtained by vertically stretching the graph of $f(x) = x^2$ by a factor of 8 and then shifting the graph down 7 units. Thus the vertex is $(0, -7)$.

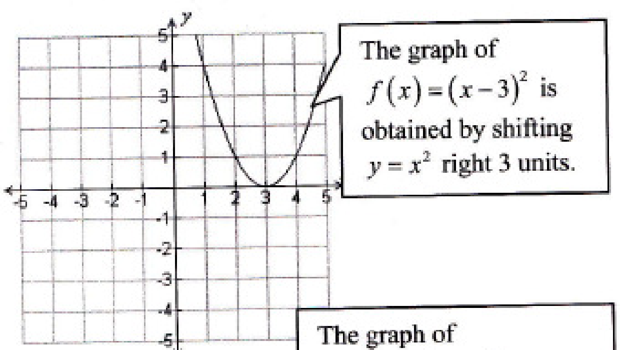
51. The graph of $f(x) = (x-8)^2 - 7$ is obtained by shifting the graph of $f(x) = x^2$ right 8 units and down 7 units. Thus the vertex is $(8, -7)$.

53. The graph of $f(x) = -(x-8)^2 + 7$ is obtained by shifting the reflection of the graph of $f(x) = x^2$ right 8 units and up 7 units. Thus the vertex is $(8, 7)$.

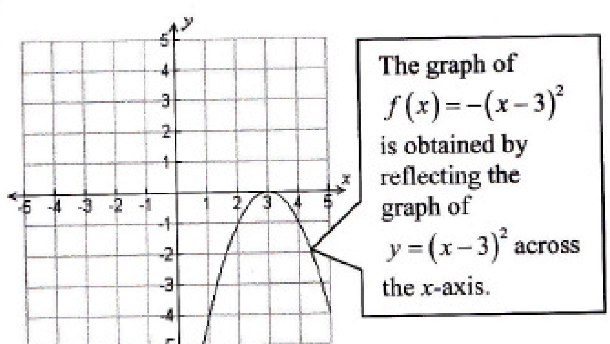
55.



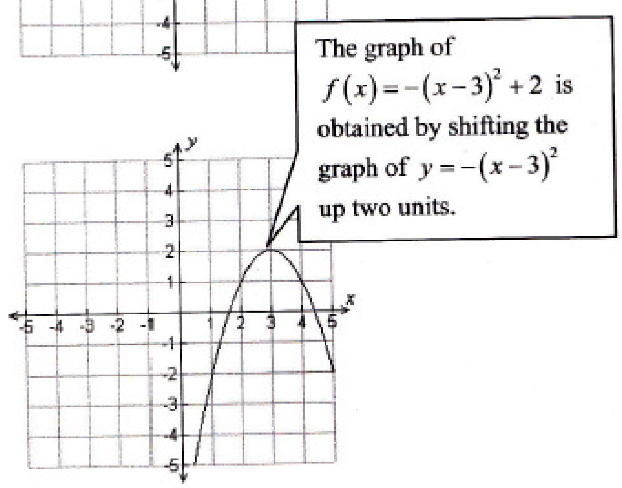
a.



b.



c.



57. A vertical stretching of $y = f(x)$ by a factor of 7 is obtained by multiplying the function by 7. Answer: **B.**

59. A reflection of $y = f(x)$ is obtained by multiplying the function by -1. Answer: **D.**

61. A horizontal shift of $y = f(x)$ right 7 units is obtained by subtracting 7 to x within the function. Answer: **F.**

63. Range: $[2+2, 6+2) = [4, 8)$

65. Range: $[2(2), 2(6)) = [4, 12)$

67. Range: $(-6, -2]$

69.

a.

n	$a_n = n^3$
1	$a_1 = (1)^3 = 1$
2	$a_2 = (2)^3 = 8$
3	$a_3 = (3)^3 = 27$
4	$a_4 = (4)^3 = 64$
5	$a_5 = (5)^3 = 125$

b.

n	$a_n = -n^3$
1	$a_1 = -(1)^3 = -1$
2	$a_2 = -(2)^3 = -8$
3	$a_3 = -(3)^3 = -27$
4	$a_4 = -(4)^3 = -64$
5	$a_5 = -(5)^3 = -125$

c.

n	$a_n = 2n^3$
1	$a_1 = 2(1)^3 = 2$
2	$a_2 = 2(2)^3 = 16$
3	$a_3 = 2(3)^3 = 54$
4	$a_4 = 2(4)^3 = 128$
5	$a_5 = 2(5)^3 = 250$

d.

n	$a_n = n^3 - 2$
1	$a_1 = (1)^3 - 2 = -1$
2	$a_2 = (2)^3 - 2 = 6$
3	$a_3 = (3)^3 - 2 = 25$
4	$a_4 = (4)^3 - 2 = 62$
5	$a_5 = (5)^3 - 2 = 123$

71. **a.** $A_n = n$

b. $V_n = 50n$

73.

Investment I

T years	I interest
5	4000
10	8000
15	12000
20	16000

Investment II

T years	I interest
5	$\frac{3}{4}(4000) = 3{,}000$
10	$\frac{3}{4}(8000) = 6{,}000$
15	$\frac{3}{4}(12000) = 9{,}000$
20	$\frac{3}{4}(16000) = 12{,}000$

Cumulative Review

1. The horizontal line through $(2, -3)$ is $y = -3$

2. The vertical line through $(2, -3)$ is $x = 2$

3. Use the point-slope form of the line:

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = \frac{3}{5}(x - 2)$$

$$y + 3 = \frac{3}{5}x - \frac{6}{5}$$

$$y = \frac{3}{5}x - \frac{6}{5} - 3$$

$$y = \frac{3}{5}x - \frac{21}{5}$$

4. First, find the slope: $m = \frac{2-(-3)}{7-2} = \frac{5}{5} = 1.$

Use the slope intercept form:

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = 1(x - 2)$$

$$y + 3 = x - 2$$

$$y = x - 5$$

5. Using the point-slope form we know that the equation of the line is:

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = -\frac{3}{4}(x - 2)$$

$$y + 3 = -\frac{3}{4}x + \frac{6}{4}$$

$$y + 3 = -\frac{3}{4}x + \frac{6}{4}$$

$$y = -\frac{3}{4}x + \frac{6}{4} - 3$$

$$y = -\frac{3}{4}x - \frac{3}{2}$$

With $x = 6$ we have

$$y = -\frac{3}{4}(6) - \frac{3}{2} = -\frac{9}{2} - \frac{3}{2} = -\frac{12}{2} = -6$$