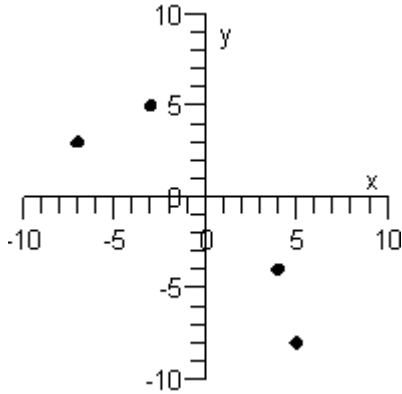


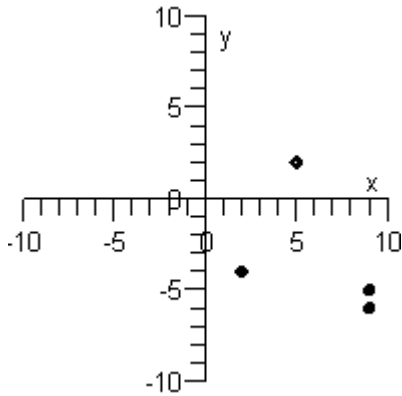
1. Plot the points below whose coordinates are given on a Cartesian coordinate system.

$(-3, 5), (-7, 3), (4, -4), (5, -8)$

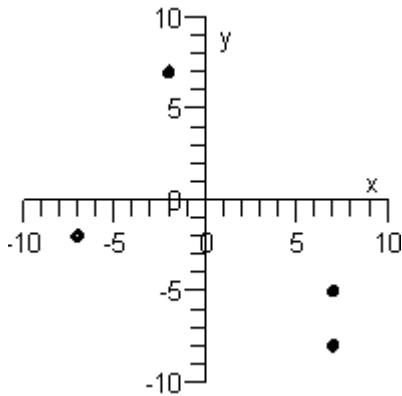
A)



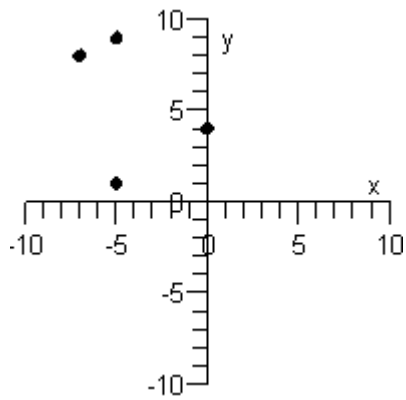
B)



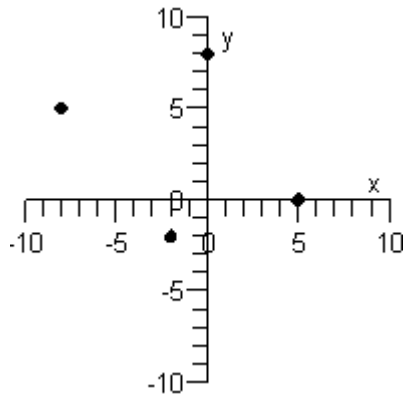
C)



D)



E)



Ans: A

2. Find the distance between the points. Round to the nearest hundredth, if necessary.

$(9, 2), (5, 5)$

- A) 15.65
- B) 14.32
- C) 5
- D) 8.06
- E) 7

Ans: C

3. Find the midpoint of the line segment joining the points.

$(7, -7), (-7, -5)$

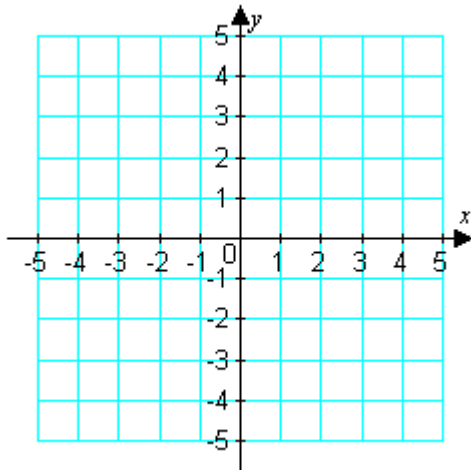
- A) $(0, 6)$
- B) $(-6, 0)$
- C) $(-1, 7)$
- D) $(7, -1)$
- E) $(0, -6)$

Ans: E

4. Find x such that the distance between the point $(2, 0)$ and $(x, -8)$ is 10.
- A) $x = 8, 10$
 - B) $x = -6, 10$
 - C) $x = -4, 10$
 - D) $x = -6, 8$
 - E) $x = -4, 8$
- Ans: E

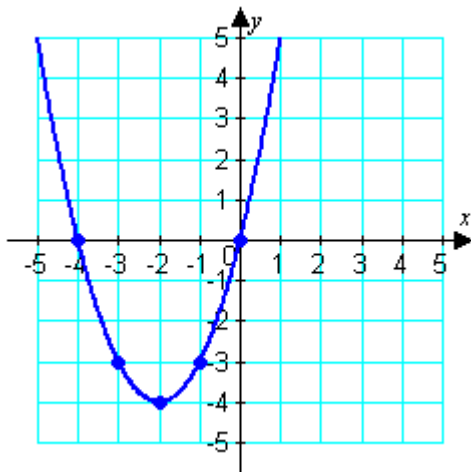
5. After completing the table, use the resulting solution points to sketch the graph of the equation $y = x^2 + 4x$.

x	-4	-3	-2	-1	0
y					
(x, y)					



Ans:

x	-4	-3	-2	-1	0
y	0	-3	-4	-3	0
(x, y)	$(-4, 0)$	$(-3, -3)$	$(-2, -4)$	$(-1, -3)$	$(0, 0)$



6. Find the x - and y -intercepts of the graph of the following equation.

$$-9x + 10y = 11$$

- A) x -int: $\left(-\frac{9}{10}, 0\right)$; y -int: $\left(0, -\frac{10}{9}\right)$
- B) x -int: $\left(-\frac{9}{10}, 0\right)$; y -int: $\left(0, \frac{11}{10}\right)$
- C) x -int: $\left(-\frac{11}{9}, 0\right)$; y -int: $\left(0, \frac{11}{10}\right)$
- D) x -int: $\left(-\frac{9}{11}, 0\right)$; y -int: $\left(0, -\frac{9}{10}\right)$
- E) x -int: $\left(-\frac{11}{9}, 0\right)$; y -int: $\left(0, -\frac{10}{9}\right)$

Ans: C

7. Find the x - and y -intercepts of the graph of the equation below.

$$y = x\sqrt{x-3}$$

- A) $(3, 0), (0, 3)$
- B) $(0, 0), (3, 0)$
- C) $(0, 0), (-3, 0)$
- D) $(0, 0), (-3, 0), (3, 0)$
- E) $(0, 0), (3, 0), (0, 3)$

Ans: B

8.

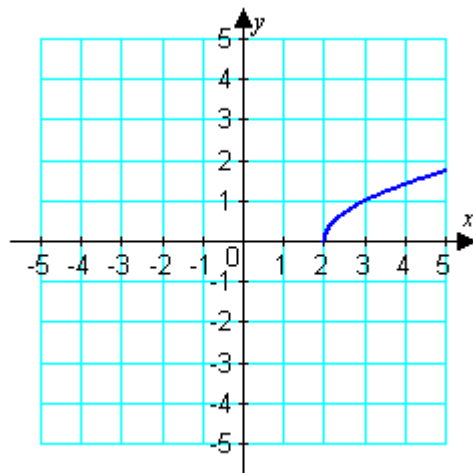
Given $y = \frac{x}{x^2 + 1}$, use the algebraic tests to determine symmetry with respect to both axes and the origin.

- A) y -axis symmetry only
- B) x -axis symmetry only
- C) origin symmetry only
- D) x -axis, y -axis, and origin symmetry
- E) no symmetry

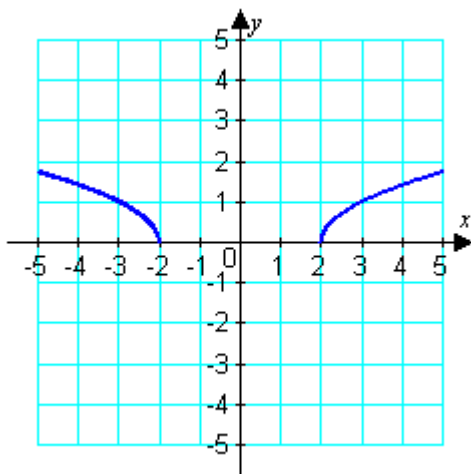
Ans: C

9. Given $x^2 + y^2 = 4$, use the algebraic tests to determine symmetry with respect to both axes and the origin.
- A) y -axis symmetry only
 - B) x -axis symmetry only
 - C) origin symmetry only
 - D) x -axis, y -axis, and origin symmetry
 - E) no symmetry
- Ans: D

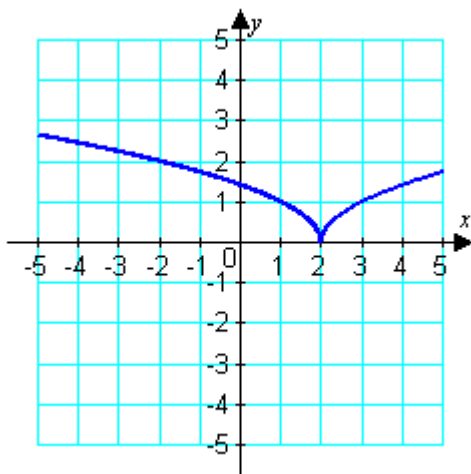
10. Assuming that the graph shown has y -axis symmetry, sketch the complete graph.



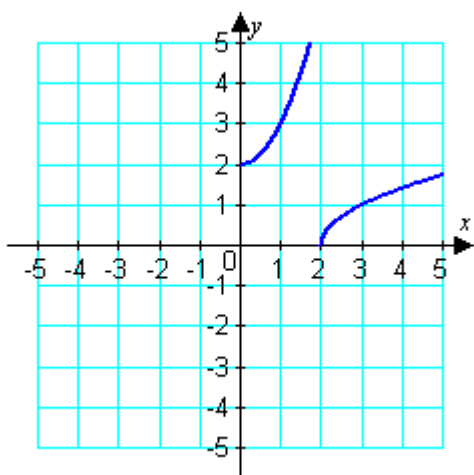
A)



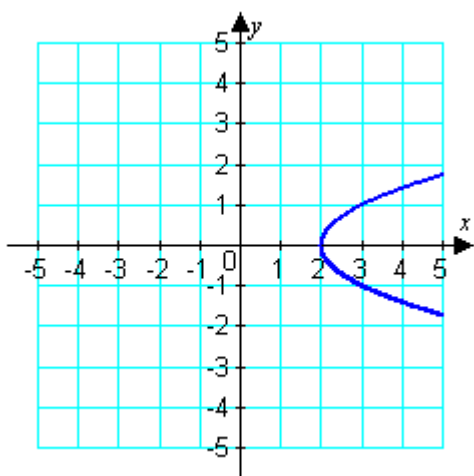
B)



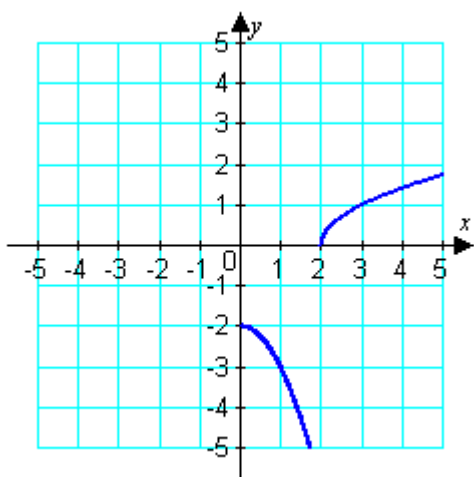
C)



D)



E)

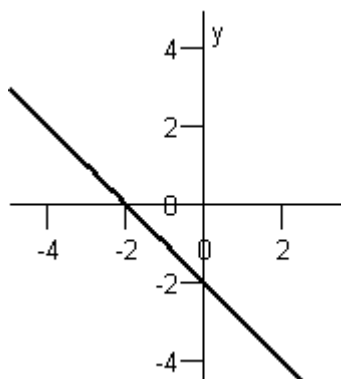


Ans: A

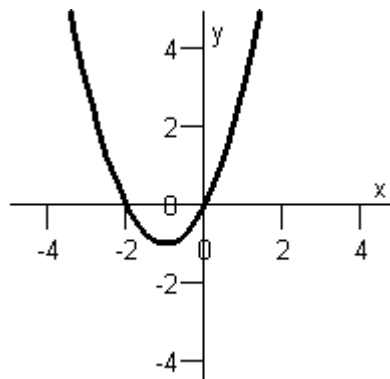
11. Match the equation below with its graph.

$$y = -2 - x$$

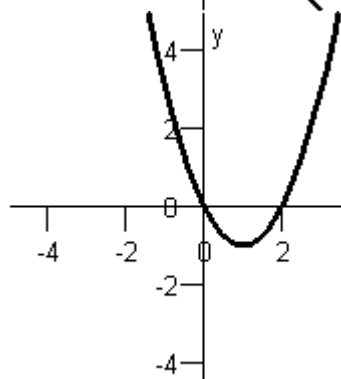
Graph I :



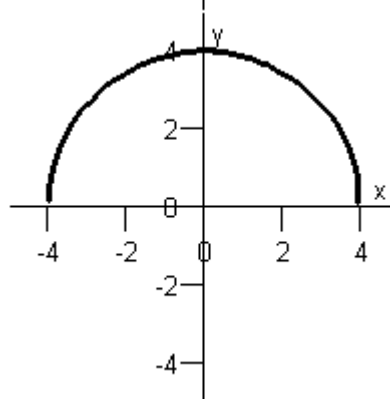
Graph IV :



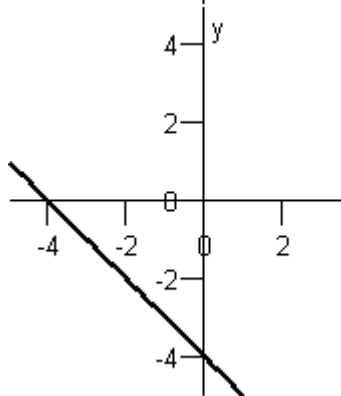
Graph II :



Graph V :



Graph III :



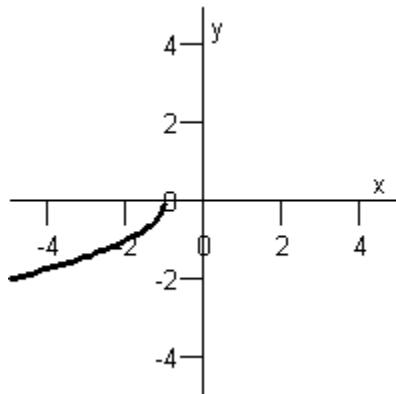
- A) Graph IV
- B) Graph III
- C) Graph V
- D) Graph II
- E) Graph I

Ans: E

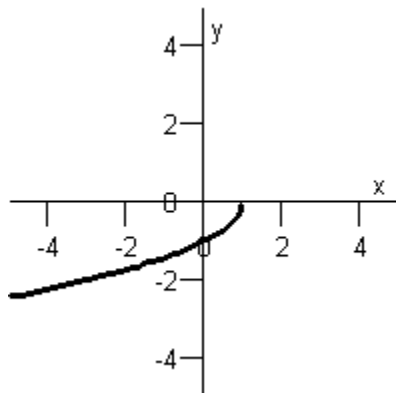
12. Sketch the graph of the equation below.

$$y = -\sqrt{-x-1}$$

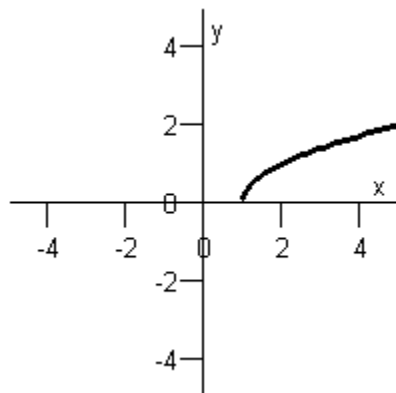
A)



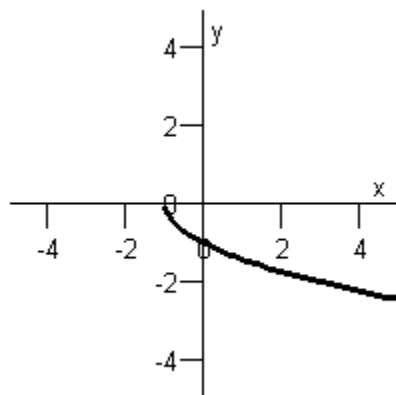
B)



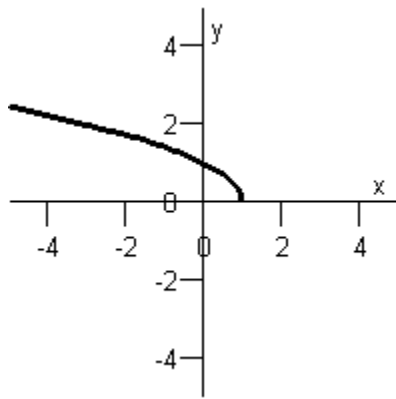
C)



D)



E)

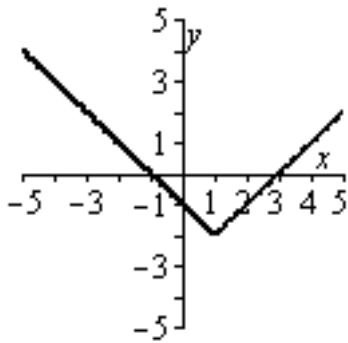


Ans: A

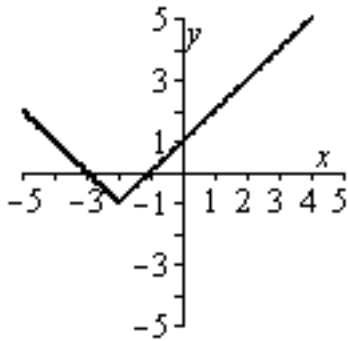
13. Graph the following equation by plotting points that satisfy the equation.

$$y = |x + 1| - 2$$

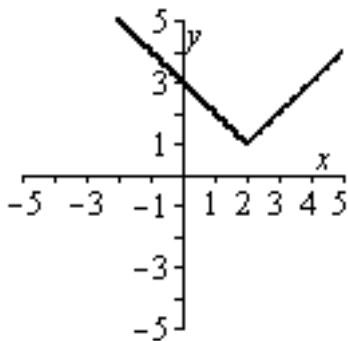
A)



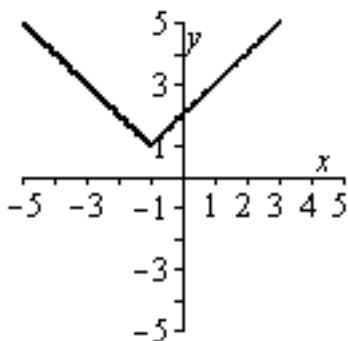
B)



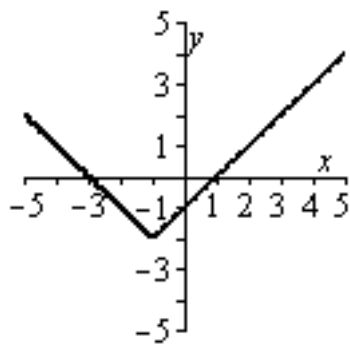
C)



D)



E)

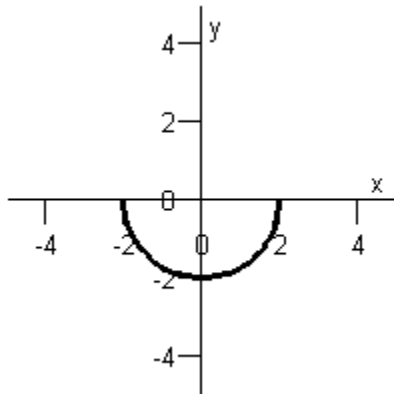


Ans: E

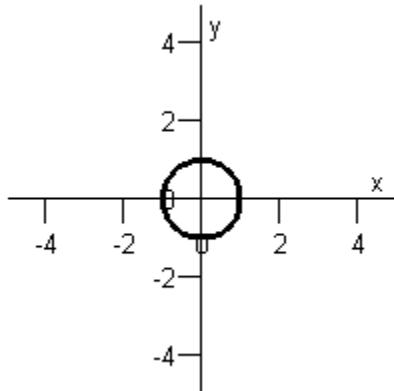
14. Sketch the graph of the equation below.

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

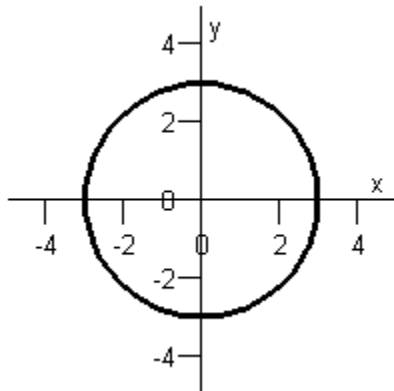
A)



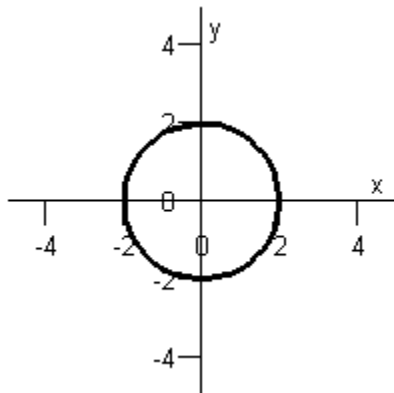
B)



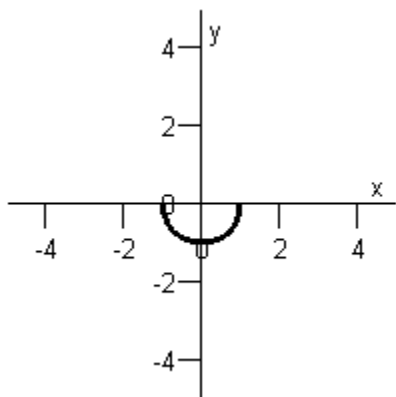
C)



D)



E)



Ans: B

15. Find an equation of a circle that satisfies the following condition. Write your answer in standard form.

Center: $(-4, -5)$; passing through $(2, -3)$

- A) $(x - 4)^2 + (y - 5)^2 = (\sqrt{10})^2$
B) $(x - 2)^2 + (y + 3)^2 = (\sqrt{10})^2$
C) $(x + 4)^2 + (y + 5)^2 = (\sqrt{13})^2$
D) $(x + 4)^2 + (y + 5)^2 = (2\sqrt{10})^2$
E) $(x - 2)^2 + (y + 3)^2 = (\sqrt{13})^2$

Ans: D

16. Write the standard form of the equation of the circle whose diameter has endpoints of $(0, -2)$ and $(6, 6)$.

- A) $(x - 3)^2 + (y - 2)^2 = 25$
B) $(x - 3)^2 + (y - 2)^2 = 5$
C) $(x - 2)^2 + (y - 3)^2 = 25$
D) $(x + 2)^2 + (y + 3)^2 = 25$
E) $(x + 3)^2 + (y + 2)^2 = 5$

Ans: A

17. The population y (in millions of people) of North America from 1980 to 2050 can be modeled by

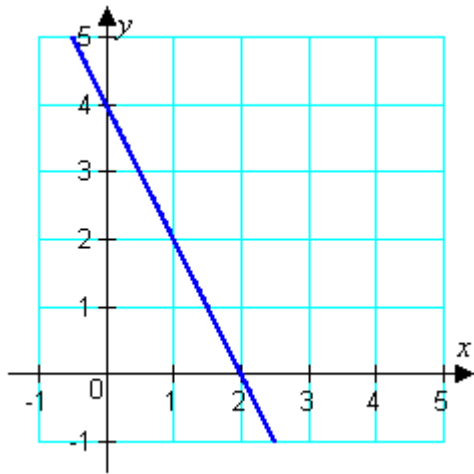
$$y = 5.3x + 483, \quad -40 \leq x \leq 30$$

where x represents the year, with $x = 30$ corresponding to 2050. Find the y-intercept of the graph of the model. What does it represent in the given situation?

- A) $(0, 642)$; It represents the population (in millions of people) of North America in 2050.
- B) $(0, 324)$; It represents the population (in millions of people) of North America in 1990.
- C) $(0, 536)$; It represents the population (in millions of people) of North America in 2030.
- D) $(0, 483)$; It represents the population (in millions of people) of North America in 2020.
- E) $(0, 271)$; It represents the population (in millions of people) of North America in 1980.

Ans: D

18. Estimate the slope of the line.



A)

$$-\frac{1}{2}$$

B)

$$2$$

C)

$$-2$$

D)

$$\frac{1}{2}$$

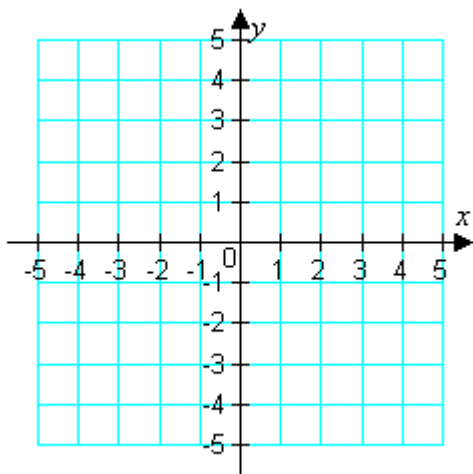
E)

$$-3$$

Ans: C

19. Plot the points and find the slope of the line passing through the pair of points.

$(2, -4), (4, -1)$



- A) $\frac{2}{3}$
slope: $\frac{2}{3}$
- B) $-\frac{2}{3}$
slope: $-\frac{2}{3}$
- C) $\frac{6}{5}$
slope: $\frac{6}{5}$
- D) $\frac{3}{2}$
slope: $\frac{3}{2}$
- E) $-\frac{3}{2}$
slope: $-\frac{3}{2}$

Ans: D

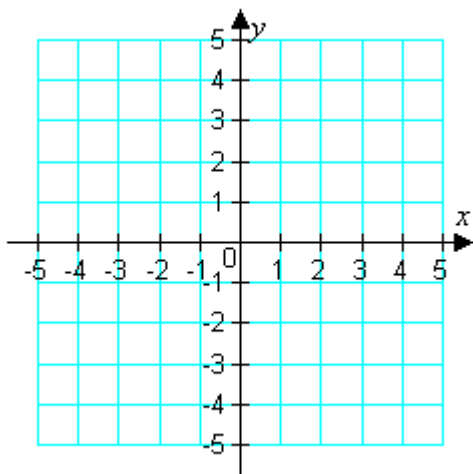
20. Find the slope of the line that passes through the points $(-6, 3)$ and $(-6, -2)$.

- A) 9
- B) -5
- C) 5
- D) 0
- E) undefined

Ans: E

21. Plot the points and find the slope of the line passing through the pair of points.

$(3, -2), (-4, -2)$



- A) slope: 0
- B) slope: 1
- C) slope: -7
- D) slope: $-\frac{1}{7}$
- E) slope: undefined

Ans: A

22. Find the slope of the line that passes through the points $A(-6, 2)$ and $B(10, -7)$.

- A) $-\frac{9}{16}$
- B) $-\frac{17}{8}$
- C) $\frac{9}{16}$
- D) $-\frac{1}{8}$
- E) $-\frac{5}{4}$

Ans: A

23. Use the point on the line and the slope of the line to determine whether any of the three additional points lies on the line.

Point

$(6, 7)$

Slope

$$m = \frac{1}{2}$$

I: $(-2, 3)$

II: $(2, 8)$

III: $(8, 5)$

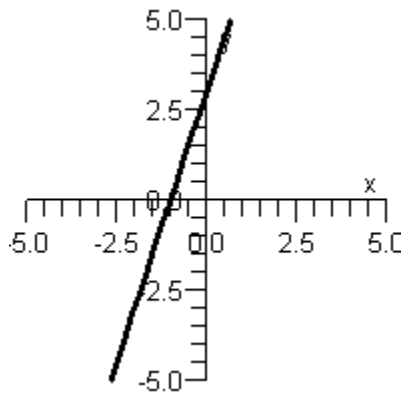
- A) Only point I lies on the line.
- B) None of the points lies on the line.
- C) Only point III lies on the line.
- D) Only points I and II lie on the line.
- E) Only points I and III lie on the line.

Ans: A

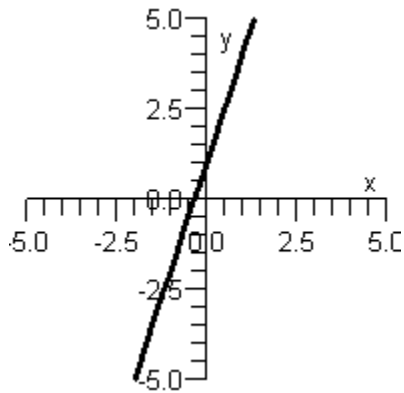
24. Graph y as a function of x by finding the slope and y -intercept of the line below.

$$y = 3x + 1$$

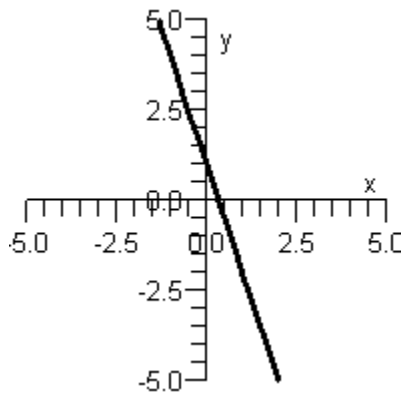
A)



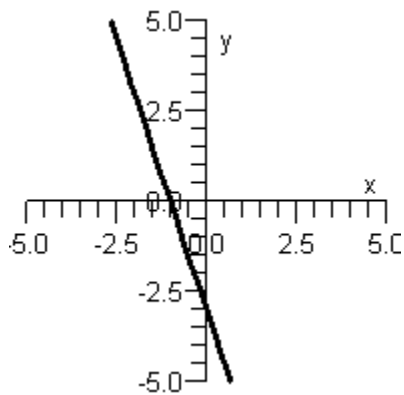
B)



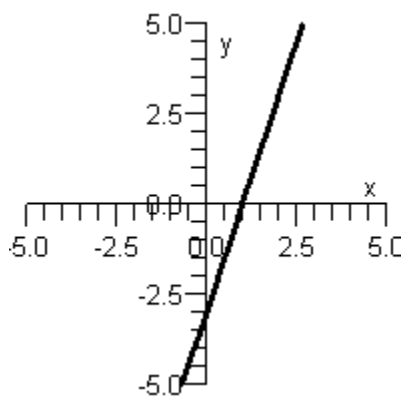
C)



D)



E)



Ans: B

25. Find the slope and y-intercept of the equation of the line.

$$y = -6x + 4$$

- A) $-\frac{1}{6}$; y-intercept: 4
B) $\frac{1}{4}$; y-intercept: -6
C) slope: -6; y-intercept: 4
D) slope: 4; y-intercept: -6
E) slope: -6; y-intercept: -4

Ans: C

26. Find the slope and y-intercept of the equation of the line.

$$-y - 8x = -2$$

- A) slope: 8; y-intercept: -2
B) slope: -2; y-intercept: 8
C) slope: 8; y-intercept: -1
D) slope: 2; y-intercept: -8
E) slope: -8; y-intercept: 2

Ans: E

27. Use the *intercept form* to find the equation of the line with the given intercepts.

The intercept form of the equation of a line with intercepts $(a, 0)$ and $(0, b)$ is

$$\frac{x}{a} + \frac{y}{b} = 1, \quad a \neq 0, \quad b \neq 0.$$

x -intercept: $(3, 0)$

y -intercept: $(0, 5)$

A) $5x + 3y = 1$

B) $5x + 3y = \frac{1}{15}$

C) $3x + 5y = \frac{1}{15}$

D) $3x + 5y = 15$

E) $5x + 3y = 15$

Ans: E

28. Determine if lines L_1 and L_2 are parallel, perpendicular, or neither.

$$L_1 : 4x + 2y = 6$$

$$L_2 : 2x - 4y = -7$$

A) parallel

B) neither

C) perpendicular

Ans: C

29. Determine whether lines L_1 and L_2 passing through the pairs of points are parallel, perpendicular, or neither.

$$L_1 : (-5, -5), (4, 6)$$

$$L_2 : (-9, 8), (-18, -3)$$

A) parallel

B) perpendicular

C) neither

Ans: A

30. Determine whether lines L_1 and L_2 passing through the pairs of points are parallel, perpendicular, or neither.

$$L_1 : (-1, 8), (9, -4)$$

$$L_2 : (0, 9), (1, -1)$$

A) parallel

B) perpendicular

C) neither

Ans: C

31. Determine whether lines L_1 and L_2 passing through the pairs of points are parallel, perpendicular, or neither.

$$L_1: (1, 2), (1, 4)$$

$$L_2: (-7, -8), (-9, -8)$$

- A) parallel
B) perpendicular
C) neither

Ans: B

32. Assume that y is directly proportional to x . If $x = 8$ and $y = 6$, determine a linear model that relates y and x .

- A) $y = \frac{4}{3}x$
B) $y = \frac{3}{5}x$
C) $y = \frac{3}{2}x$
D) $y = \frac{3}{4}x$
E) $y = \frac{2}{3}x$

Ans: D

33. Write the equation that expresses the relationship between the variables described below, then use the given data to solve for the variation of constant.

" t varies directly as s , and $t = 97.66$ when $s = 19$."

- A) $t = \frac{k}{s}$; $k = 1855.54$
B) $t = \sqrt{ks}$; $k = 26.42$
C) $t = ks$; $k = 5.14$
D) $t = k^2s$; $k = 2.27$
E) $t = \sqrt{ks}$; $k = 501.97$

Ans: C

34. The simple interest on an investment is directly proportional to the amount of the investment. By investing \$5750 in a certain certificate of deposit, you obtained an interest payment of \$172.50 after 1 year. Determine a mathematical model that gives the interest, I , for this CD after 1 year in terms of the amount invested, P .

- A) $I = (0.028)P$
- B) $I = (0.033)P$
- C) $I = (0.025)P$
- D) $I = (0.034)P$
- E) $I = (0.030)P$

Ans: E

35. The sales tax on an item with a retail price of \$908 is \$99.88. Create a mathematical model that gives the retail price, y , in terms of the sales tax, x , and use it to determine the retail price of an item that has a sales tax of \$113.50.

- A) \$1044.05
- B) \$1033.81
- C) \$976.13
- D) \$1003.45
- E) \$1031.82

Ans: E

36. After opening the parachute, the descent of a parachutist follows a linear model. At 7:28 P.M., the height of the parachutist is 6150 feet. At 7:31 P.M., the height is 3450 feet. Use a linear equation that gives the height of the parachutist in terms of the time to find the time when the parachutist will reach the ground.

- A) 7:33:30 P.M.
- B) 7:34:50 P.M.
- C) 7:32:00 P.M.
- D) 7:37:30 P.M.
- E) 7:31:00 P.M.

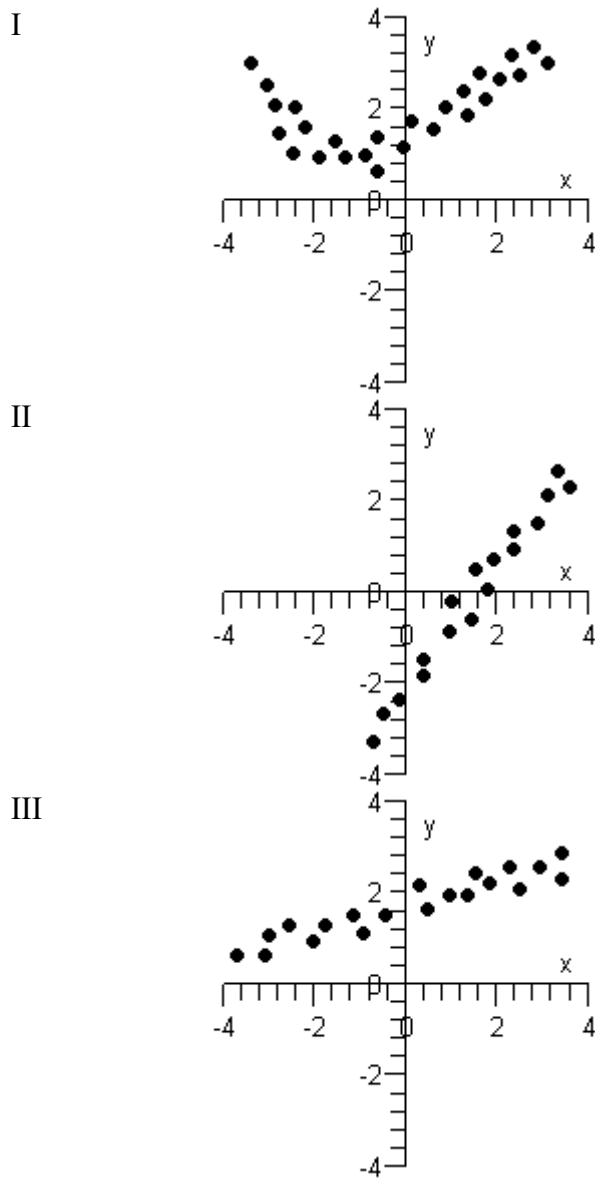
Ans: B

37. A motorcycle was purchased for \$39,000. Assuming the motorcycle depreciates at a rate of \$4680 per year (*straight-line depreciation*) for the first 7 years, write the value v of the motorcycle as a function of the time t (measured in years) for $0 \leq t \leq 7$.

- A) $v(t) = 4680t - 39,000$
- B) $v(t) = 39,000 - 4680(7)t$
- C) $v(t) = 39,000 - 4680t$
- D) $v(t) = 39,000 + 4680(7)t$
- E) $v(t) = 39,000 + 4680t$

Ans: C

38. Which of the following graphs below can be approximated by a linear model?



- A) None can be modeled linearly.
- B) Only graphs II and III can be modeled linearly.
- C) Only graph III can be modeled linearly.
- D) Only graphs I and II can be modeled linearly.
- E) Only graph I can be modeled linearly.

Ans: B

39. The table below shows the velocities, in feet per second, of a ball that is thrown horizontally from the top of a 50 foot building and the distances, in feet, that it lands from the base of the building. Compute the linear regression equation for these data.

Velocity (ft/sec)	Distance (ft)
10	30
15	50
22	60
25	75
35	100
40	119
50	155

- A) $y = 3.028222013x - 1.079962371$
B) $y = 2.944432432x - 0.7139459459$
C) $y = 3.02463355x + 3.626221498$
D) $y = 3.156886228x + .5988023952$
E) $y = 3.073502956x + 2.338987407$

Ans: A

40. Suppose the average remaining lifetime for women in a given country is given in the following table.

<i>Age</i>	<i>Years</i>
5	85.8
20	72.2
40	52.0
60	35.1
80	15.3

Compute the linear regression equation for these data, where x is the age, in years, and A is the remaining lifetime, in years. Round parameters to the nearest hundredth.

- A) $A(x) = -0.94x + 105.51$
B) $A(x) = -17.81x + 90.51$
C) $A(x) = -17.81x + 105.51$
D) $A(x) = -0.94x + 54.89$
E) $A(x) = -0.94x + 90.51$

Ans: E

41. Suppose the average remaining lifetime for women in a given country is given in the following table.

<i>Age</i>	<i>Years</i>
5	71.1
15	63.6
20	59.5
45	37.2
50	32.8

Find the linear regression equation for these data, whose parameters are rounded to the nearest hundredth, where x is the age, in years, and A is the remaining lifetime, in years. Use the regression equation to estimate the remaining lifetime for a 30-year old woman.

- A) 59.79 years
B) 43.45 years
C) 49.47 years
D) 52.05 years
E) 57.21 years

Ans: C

42. Which set of ordered pairs represents a function from P to Q ?

$$P = \{5, 10, 15, 20\} \quad Q = \{-1, 1, 3\}$$

- A) $\{(5, -1), (10, 1), (10, 3), (15, 1), (20, -1)\}$
- B) $\{(15, -1), (15, 1), (15, 3)\}$
- C) $\{(15, 1), (10, -1), (5, 1), (10, 3), (15, -1)\}$
- D) $\{(10, 1), (15, 3), (20, 1)\}$
- E) $\{(5, 3), (15, 1), (5, -1), (15, 3)\}$

Ans: D

43. Given $p(x) = 4x^2 + 9$, find $p(3)$.

- A) 33
- B) 21
- C) 45
- D) 36
- E) 27

Ans: C

44. Given $n(x) = 5x^2 - 1$, find $n(-8)$.

- A) 320
- B) -41
- C) 321
- D) -81
- E) 319

Ans: E

45. Evaluate the function at the specified value of the independent variable and simplify.

$$f(y) = 6y + 3; \quad f(0.8)$$

- A) $4.8y + 18$
- B) 1.8
- C) 7.8
- D) $0.8y + 3$
- E) $0.8y - 3$

Ans: C

46. Given $m(x) = 4x^2 + 2$, find $m(r)$.

- A) $4r^2 + 2$
- B) $16r^2 + 4$
- C) $6r^2$
- D) $16r^2 + 2$
- E) $4r^2 + 2r$

Ans: A

47. Find all real values of x such that $f(x) = 0$.

$$f(x) = \frac{9x+6}{5}$$

- A) $-\frac{2}{15}$
- B) $\pm\frac{2}{15}$
- C) $\pm\frac{2}{3}$
- D) $-\frac{2}{3}$
- E) $\frac{2}{3}$

Ans: D

48. Find all real values of x such that $f(x) = 0$.

$$f(x) = 16x^2 - 25$$

- A) $\pm\frac{4}{5}$
- B) $\pm\frac{5}{4}$
- C) $\pm\frac{25}{16}$
- D) $-\frac{25}{16}$
- E) $\frac{5}{4}$

Ans: B

49. Find the domain of the function.

$$q(s) = \frac{-6s}{s+1}$$

- A) all real numbers $s \neq -1$
- B) all real numbers $s \neq -1, s \neq 0$
- C) all real numbers
- D) $s = -1, s = 0$
- E) $s = -1$

Ans: A

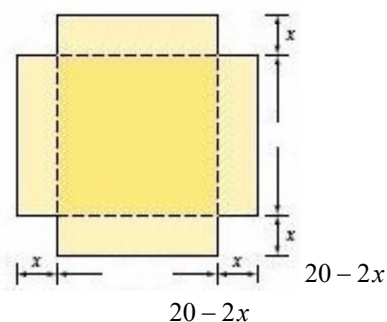
50. Find the domain of the function.

$$q(y) = \sqrt{81 - y^2}$$

- A) $-9 \leq y \leq 9$
- B) $y \leq -9$ or $y \geq 9$
- C) $y \geq 0$
- D) $y \leq 9$
- E) all real numbers

Ans: A

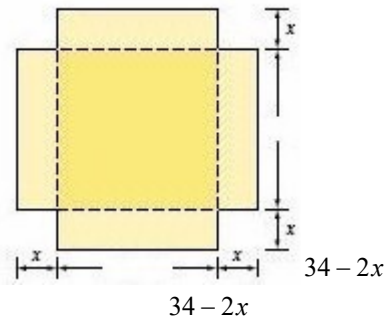
51. An open box is to be made from a square piece of cardboard having dimensions 20 inches by 20 inches by cutting out squares of area x^2 from each corner as shown in the figure below. Express the volume V of the box as a function of x .



- A) $V(x) = 20x^2 - 2x^3$
- B) $V(x) = 20x - 40x^2 + 4x^3$
- C) $V(x) = 400 - 80x + 4x^2$
- D) $V(x) = 400x - 80x^2 + 4x^3$
- E) $V(x) = 400x - 40x^2 + 4x^3$

Ans: D

52. An open box is to be made from a square piece of cardboard having dimensions 34 inches by 34 inches by cutting out squares of area x^2 from each corner as shown in the figure below. If the volume of the box is given by $V(x) = 1156x - 136x^2 + 4x^3$, state the domain of V .



- A) $0 < x < 34$
 B) $0 < x < 17$
 C) $136 < x < 1156$
 D) $4 < x < 136$
 E) all real numbers

Ans: B

53. The national defense budget expenses V (in billions of dollars) for veterans in the United States from 1990 to 2005 can be approximated by the model

$$V = \begin{cases} -0.326t^2 + 3.40t + 28.7, & 0 \leq t \leq 6 \\ 0.441t^2 - 6.23t + 62.6, & 7 \leq t \leq 15 \end{cases}$$

where t represents the year, with $t = 0$ corresponding to 1990. Use the model to find total veteran expenses in 2002.

- A) \$51.904 billion
 B) \$51.344 billion
 C) \$12.404 billion
 D) \$37.550 billion
 E) \$30.100 billion

Ans: B

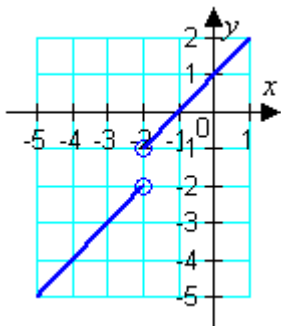
54. The inventor of a new game believes that the variable cost of producing the game is \$3.65 per unit and the fixed costs are \$5000. The inventor sells each game for \$11.09. Let x be the number of games sold. Write the average cost per unit

$\bar{C} = C/x$ as a function of x where C is defined as the total cost of producing x games.

- A) $\bar{C} = \frac{5000}{x} - 7.44x$
 B) $\bar{C} = 5000 + 3.65x$
 C) $\bar{C} = 5000 - 7.44x$
 D) $\bar{C} = \frac{5000}{x} + 3.65$
 E) $\bar{C} = \frac{5000}{x} - 7.44$

Ans: D

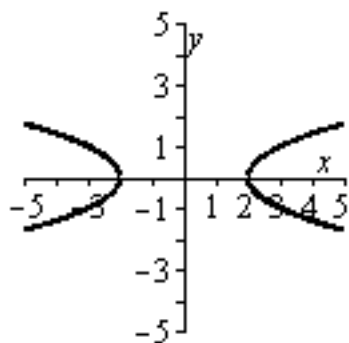
55. Use the graph of the function to find the domain and range of f .



- A) domain : all real numbers
range : $(-\infty, -2) \cup (-1, \infty)$
 B) domain : all real numbers
range : all real numbers
 C) domain : $(-\infty, -2) \cup (-2, \infty)$
range : $(-\infty, -2) \cup (-1, \infty)$
 D) domain : $(-\infty, -2) \cup (-1, \infty)$
range : $(-\infty, -2) \cup (-2, \infty)$
 E) Domain: all real numbers
Range: $(-\infty, -2] \cup [-1, \infty)$

Ans: C

56. Use the vertical line test to determine if the following graph is the graph of a function.



- A) function
B) not a function

Ans: B

57. Use a graphing utility to graph the function and approximate (to two decimal places) any relative minimum or relative maximum values.

$$f(x) = x^3 + 2x^2 + x - 5$$

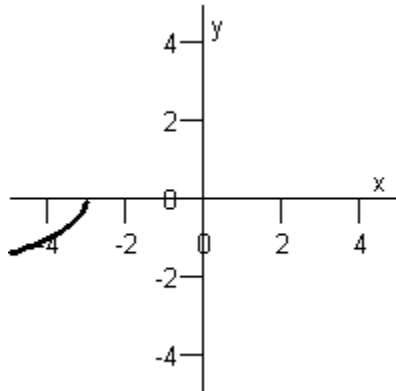
- A) relative maximum: $(-1.00, -5.00)$
relative minimum: $(-0.33, -5.15)$
B) relative maximum: $(-0.33, -5.15)$
relative minimum: $(-1.00, -5.00)$
C) relative maximum: $(-5.00, -1.00)$
relative minimum: $(-5.15, -0.33)$
D) relative maximum: $(-5.15, -0.33)$
relative minimum: $(-5.00, -1.00)$
E) relative maximum: $(-5.15, -93.58)$
relative minimum: $(-5.00, -85.00)$

Ans: A

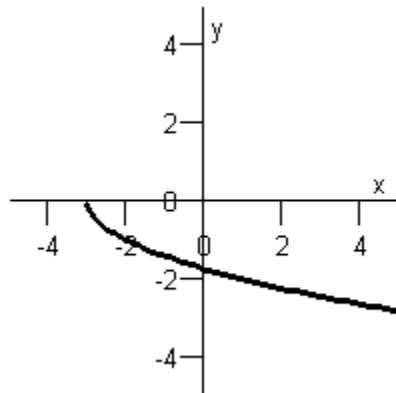
58. Sketch the graph of the function below.

$$f(x) = -\sqrt{-x+3}$$

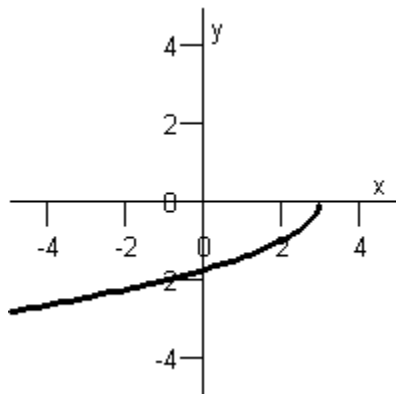
A)



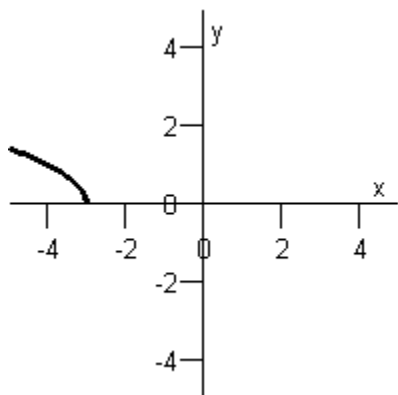
B)



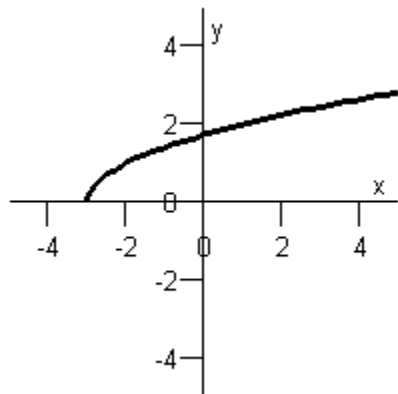
C)



D)



E)

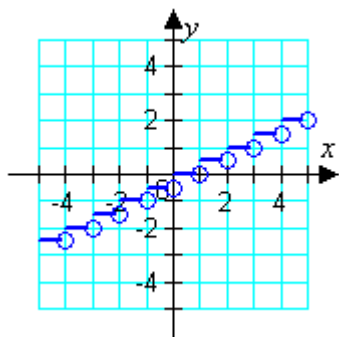


Ans: C

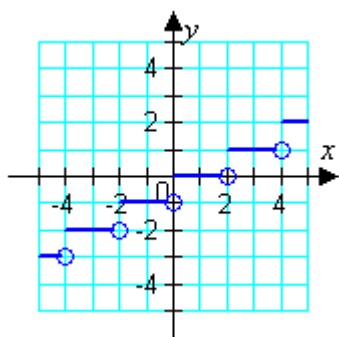
59. Which graph represents the function?

$$g(x) = 2\llbracket x \rrbracket$$

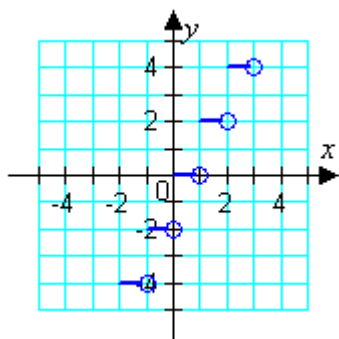
A)



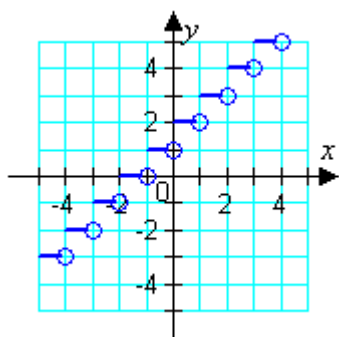
B)



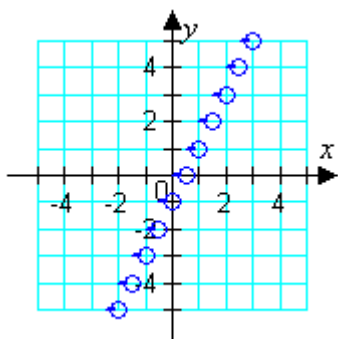
C)



D)



E)



Ans: C

60. The marketing department of a company estimates that the demand for a product is given by $p = 130 - 0.0001x$, where p is the price per unit and x is the number of units. The cost C of producing x units is given by $C = 350,000 + 10x$, and the profit P for producing and selling x units is given by

$$P = R - C = xp - C.$$

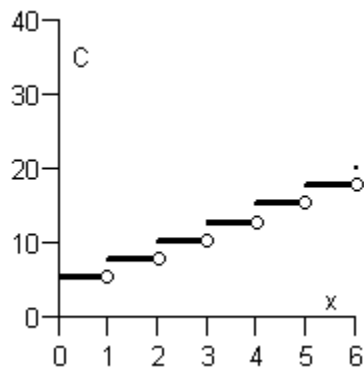
Sketch the graph of the profit function and estimate the number of units that would produce a maximum profit.

- A) 590,000 units
- B) 600,000 units
- C) 640,000 units
- D) 520,000 units
- E) 620,000 units

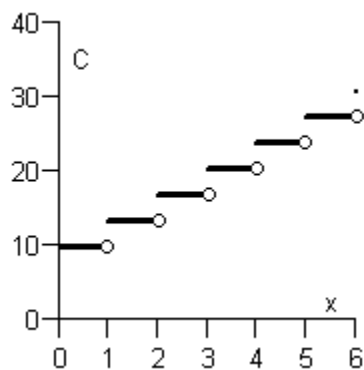
Ans: B

61. The cost of sending an overnight package from New York to Atlanta is \$9.80 for up to, but not including, 1 pound (portion of a pound). A model for the total cost C of sending the package is $C = 9.80 + 3.50\lfloor x \rfloor$, where x is the weight of the package in pounds. Which of the following is the graph of this function. Note that the function $\lfloor x \rfloor$ is the greatest integer function.

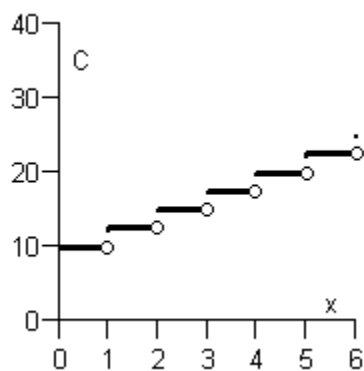
A)



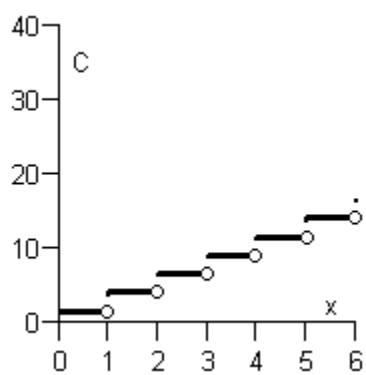
B)



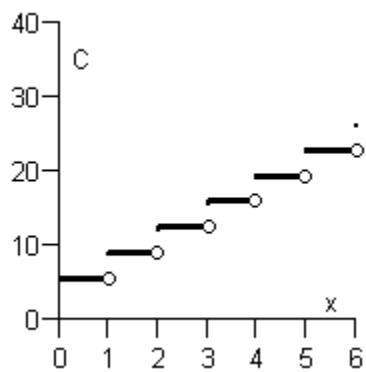
C)



D)



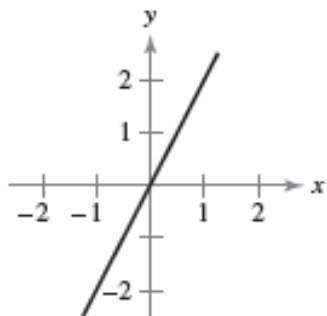
E)



Ans: B

62. Describe the increasing, decreasing, and constant behavior of the function. Find the point or points where the behavior of the function changes.

$$f(x) = 2x$$



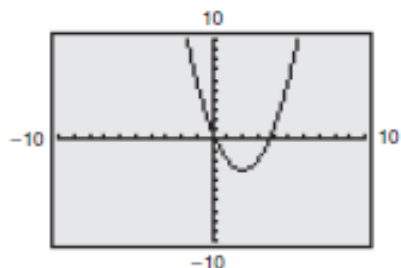
- A) Increasing on $(-\infty, \infty)$
No change in the graph's behaviour
- B) Decreasing on $(-\infty, 1)$
Increasing on $(1, \infty)$
The graph's behaviour changes at the point $(1, -1)$
- C) Increasing on $(-\infty, 0)$ and $(2, \infty)$
Decreasing on $(0, 2)$
The graph's behaviour changes at the points $(0, 0)$ and $(2, -4)$
- D) Decreasing on $(-\infty, -2)$
Increasing on $(2, \infty)$
The graph's behaviour changes at the points $(-2, 0)$ and $(2, 0)$
- E) Decreasing on $(-\infty, 0)$
Increasing on $(0, \infty)$
The graph's behaviour changes at the point $(0, 0)$

Ans: A

63. Use a graphing utility to graph the function, approximate the relative minimum or maximum of the function, and estimate the open intervals on which the function is increasing or decreasing.

$$f(x) = x^2 - 4x + 1$$

A)

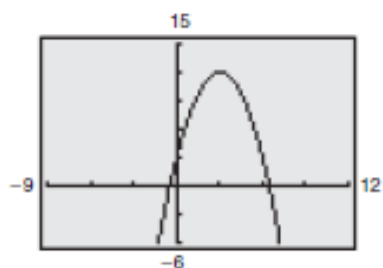


Decreasing on $(-\infty, 2)$

Increasing on $(2, \infty)$

Relative minimum: $(2, -3)$

B)

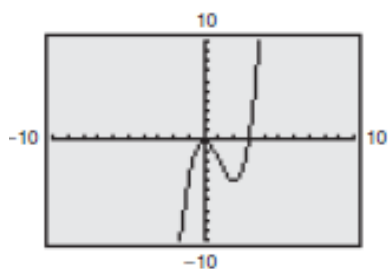


Decreasing on $(3, \infty)$

Increasing on $(-\infty, 3)$

Relative maximum: $(3, 12)$

C)



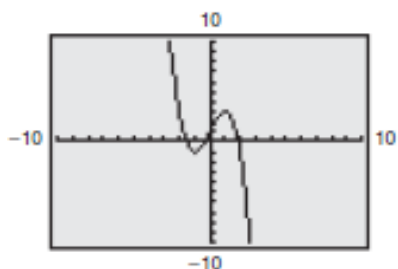
Decreasing on $(0, 2)$

Increasing on $(-\infty, 0), (2, \infty)$

Relative minimum: $(0, 0)$

Relative maximum: $(2, -4)$

D)



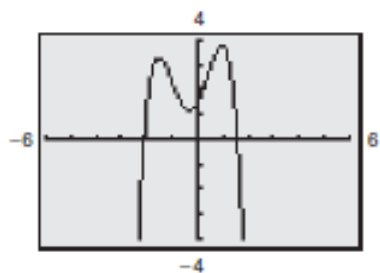
Decreasing on $(-\infty, -1), (1, \infty)$

Increasing on $(-1, 1)$

Relative minimum: $(-1, -1)$

Relative maximum: $(1, 3)$

E)



Decreasing on $(1, \infty)$

Increasing on $(-\infty, 1)$

Relative minimum: $(-1, 1)$

Relative maximum: $(1, 2)$

Ans: A

64. Evaluate the function at each specified value of the independent variable.

$$f(x) = \lfloor x \rfloor$$

a) $f(2)$

b) $f(2.5)$

c) $f(-2.5)$

d) $f(-4)$

A) 2, 2, -3, -4

B) 2, 3, -3, -4

C) 2, 2, -2, -4

D) 2, 2.5, 2.5, 4

E) 2, 2.5, -2.5, -4

Ans: A

65. Decide whether the function is even, odd, or neither.

$$g(x) = x^3 - 5x$$

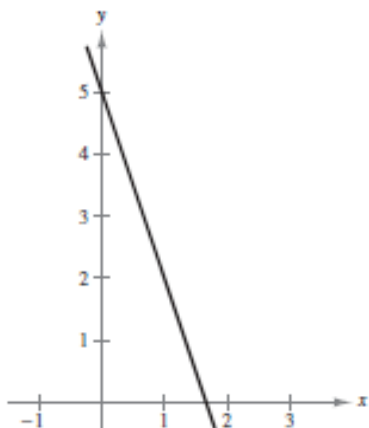
- A) Odd
- B) Even
- C) Neither even nor odd

Ans: A

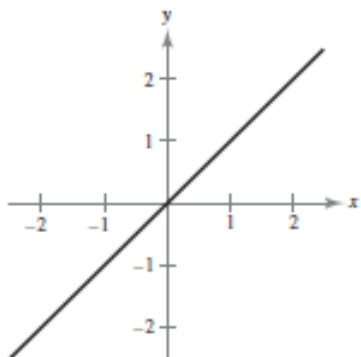
66. Sketch the graph of the function and determine whether the function is even, odd, or neither.

$$f(x) = 5 - 3x$$

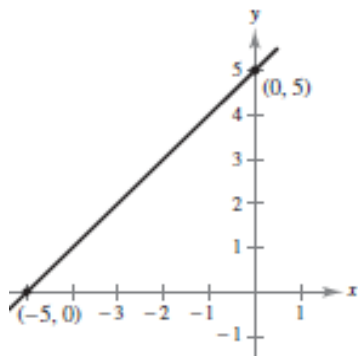
- A) Neither even nor odd



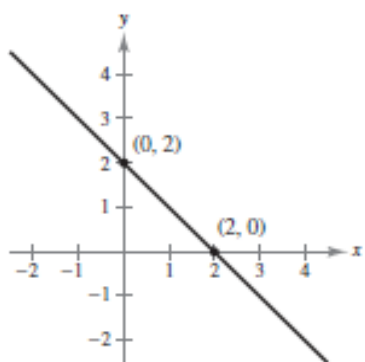
- B) Even



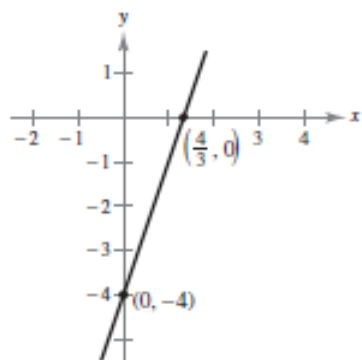
- C) Odd



- D) Odd



E) Neither even nor odd

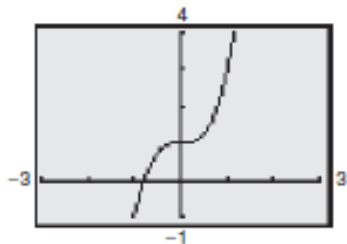


Ans: A

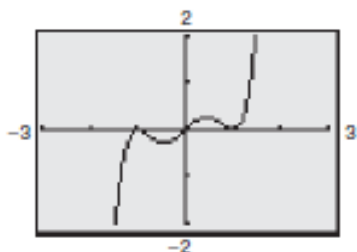
67. Use a graphing utility to graph the function and determine whether the function is even, odd, or neither.

$$f(x) = x^2 - x^4$$

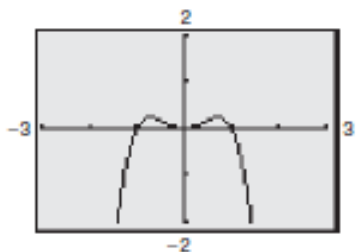
- A) Neither even nor odd



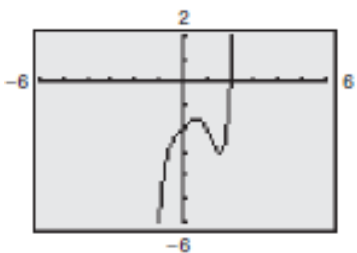
- B) Odd



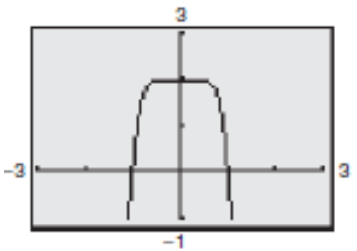
- C) Even



- D) Neither even nor odd



- E) Even

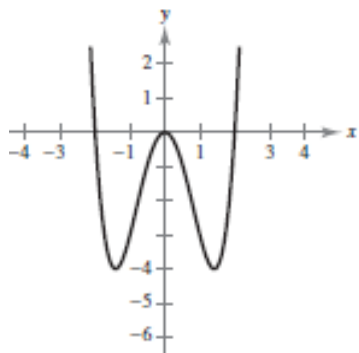


Ans: C

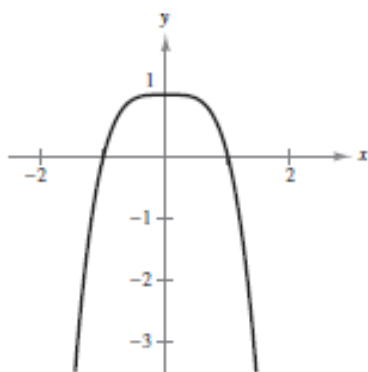
68. Sketch the graph of the function.

$$f(x) = x^2 - 9$$

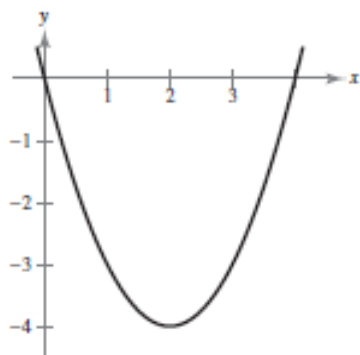
A)



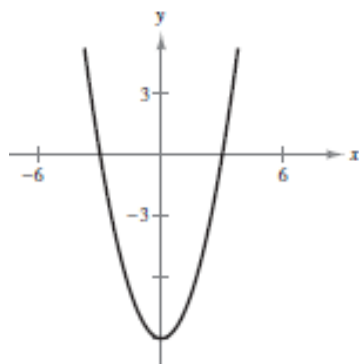
B)



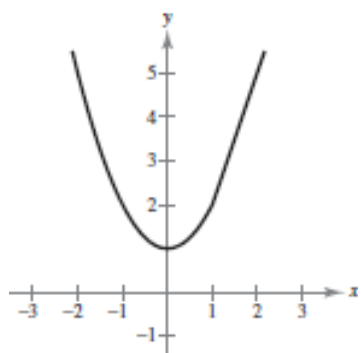
C)



D)



E)

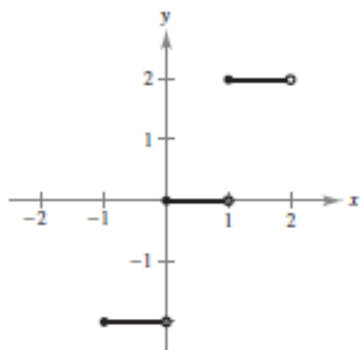


Ans: D

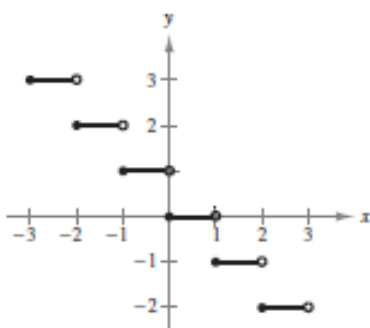
69. Sketch the graph of the function.

$$f(x) = -\llbracket x \rrbracket$$

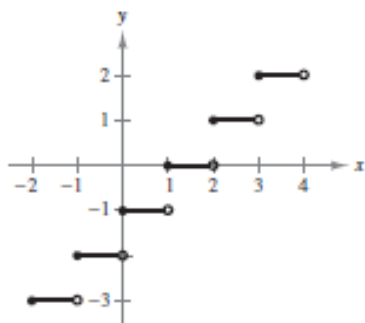
A)



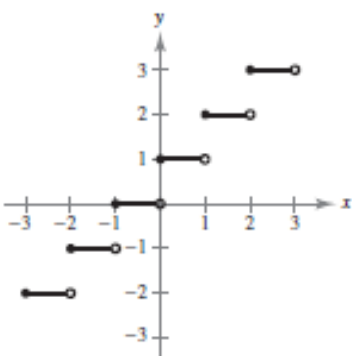
B)



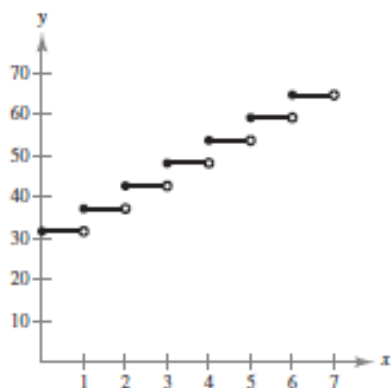
C)



D)



E)



Ans: B

70. Describe the sequence of transformation from $f(x) = x^2$ to $g(x)$ if

$$g(x) = (x + 5)^2 + 6$$

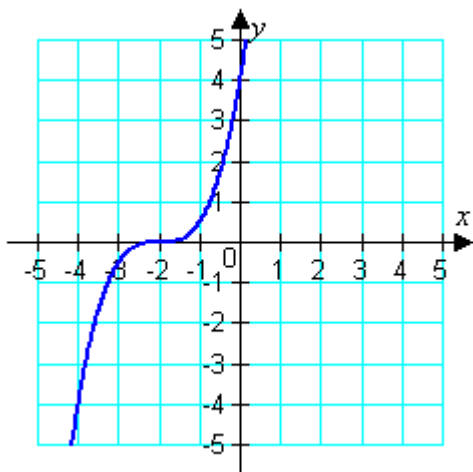
- A) Shifted five units to the left and six units downwards.
- B) Shifted six units to the left and five units downwards.
- C) Shifted five units to the right and six units upwards.
- D) Shifted six units to the right and five units downwards.
- E) Shifted five units to the left and six units upwards.

Ans: E

71. Use the graph of

$$f(x) = x^3$$

to write an equation for the function whose graph is shown.



A)

$$f(x) = 2x^3 - 2$$

B)

$$f(x) = 2x^3 + 2$$

C)

$$f(x) = \frac{1}{2}(x-2)^3$$

D)

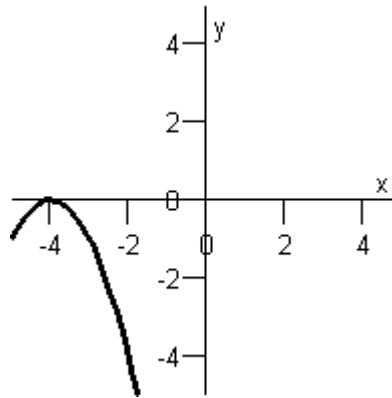
$$f(x) = 2(x+2)^3$$

E)

$$f(x) = \frac{1}{2}(x+2)^3$$

Ans: E

72. Use the graph of $f(x) = x^2$ to write an equation for the function whose graph is shown below.



- A) $g(x) = (x+4)^2$
- B) $g(x) = -(x-4)^2$
- C) $g(x) = -(x+4)^2$
- D) $g(x) = (x-4)^2$
- E) $g(x) = -(x+2)^2$

Ans: C

73. Consider the graph of $f(x) = x^3$. Use your knowledge of rigid and nonrigid transformations to write an equation for the following descriptions.

The graph of f is shifted three units to the left.

- A) $y = (x-3)^3$
- B) $y = (x+3)^3$
- C) $y = x^3 + 3$
- D) $y = x^3 - 3$
- E) $y = -3x^3$

Ans: B

74. Consider the graph of $g(x) = \sqrt{x}$. Use your knowledge of rigid and nonrigid transformations to write an equation for the following descriptions.

The graph of g is reflected in the x -axis, shifted five units to the left, and shifted four unit upward.

- A) $h(x) = -\sqrt{x+4} + 5$
- B) $h(x) = -\sqrt{x+5} + 4$
- C) $h(x) = \sqrt{x-4} - 5$
- D) $h(x) = \sqrt{x+5} + 4$
- E) $h(x) = -\sqrt{x-5} - 4$

Ans: B

75. The weekly profit P (in hundreds of dollars) for a business from a product is given by the model

$$P(x) = 110 + 60x - 0.8x^2, \quad 0 \leq x \leq 20$$

where x is the amount (in hundreds of dollars) spent on advertising. Rewrite the profit equation so that x measures advertising expenditures in dollars.

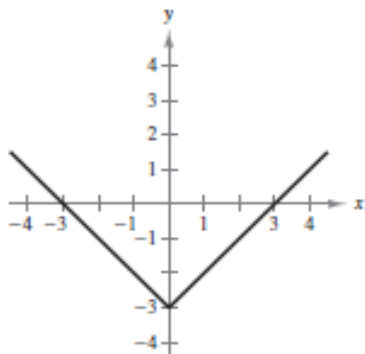
- A) $P\left(\frac{x}{100}\right) = \frac{11}{10} + \frac{3x}{5} - 0.8x^2$
- B) $P\left(\frac{x}{100}\right) = \frac{11}{10} + \frac{3x}{5} - 0.00008x^2$
- C) $P\left(\frac{x}{100}\right) = \frac{11}{10} + \frac{3x}{5} - 0.008x^2$
- D) $P\left(\frac{x}{100}\right) = 110 + \frac{3x}{5} - 0.00008x^2$
- E) $P\left(\frac{x}{100}\right) = 110 + \frac{3x}{5} - 0.008x^2$

Ans: D

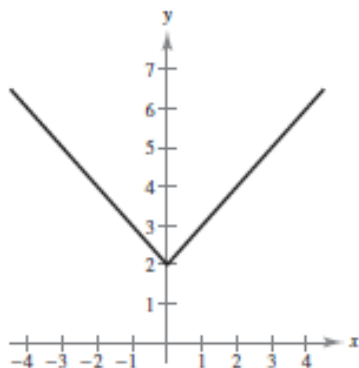
76. Describe the sequence of transformations from $f(x) = |x|$ to g . Then sketch the graph of g by hand. Verify with a graphing utility.

$$f(x) = |x| + 2$$

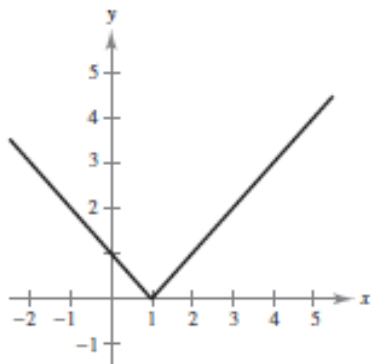
- A) Vertical shifts down 3 units



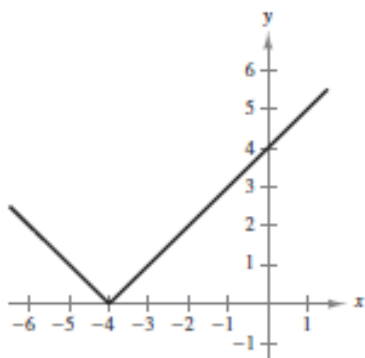
- B) Vertical shifts 2 units upward



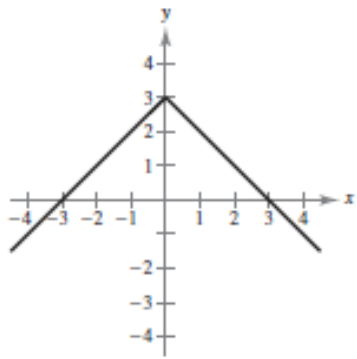
- C) Horizontal shift 1 unit to the right



- D) Horizontal shifts 4 units to the left



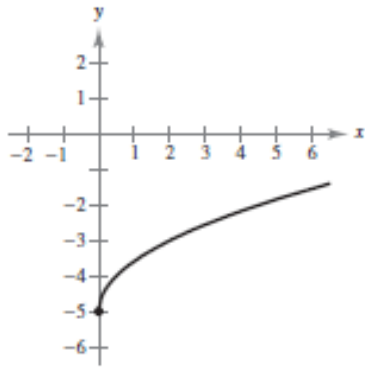
E) Vertical shifts 3 units upward



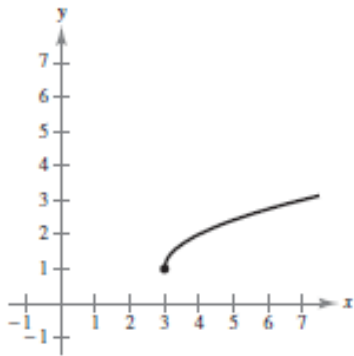
Ans: B

77. Describe the sequence of transformations from $f(x) = \sqrt{x}$ to g . Then sketch the graph of g by hand. Verify with a graphing utility.
 $g(x) = \sqrt{x-3}$

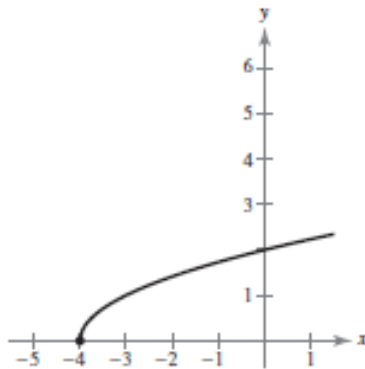
A) Shifted 5 units downward



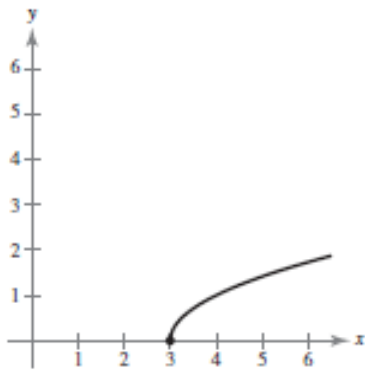
B) Shifted 1 unit upward



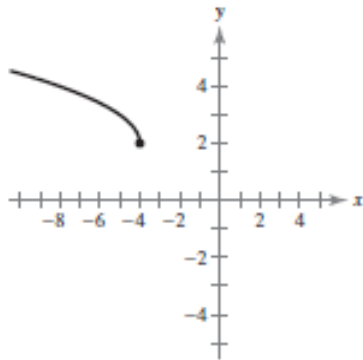
C) Shifted 4 units to the left



D) Shifts 3 units to the right

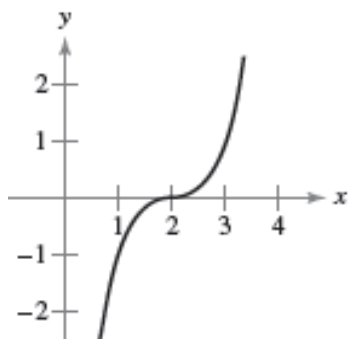


E) 4 units to the left and 2 units upward



Ans: D

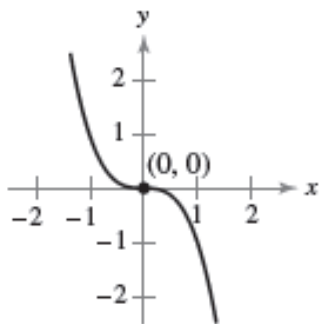
78. Identify the transformation shown in the graph and identify the associated common function. Write the equation of the graphed function.



- A) Common function: $y = x^3$
Transformation: horizontal shift 2 units to the right
Equation: $y = (x - 2)^3$
- B) Common function: $y = x$
Transformation: multiplied by $\frac{1}{2}$ shrinking
Equation: $y = \frac{1}{2}x$
- C) Common function: $y = x^2$
Transformation: reflection about the x-axis
Equation: $y = -x^2$
- D) Common function: $y = c$
Transformation: c is 7.
Equation: $y = 7$
- E) Common function: $y = \sqrt{x}$
Transformation: reflection about the x-axis and a vertical shift 1 unit upward
Equation: $y = -\sqrt{x} + 1$

Ans: B

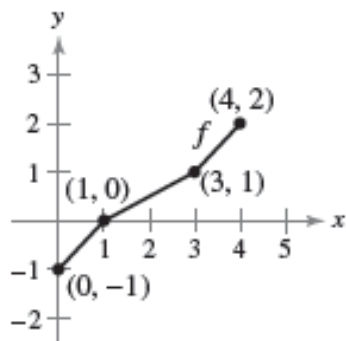
79. Use the graph of $f(x) = x^3$ to write equations for the functions whose graphs are shown.



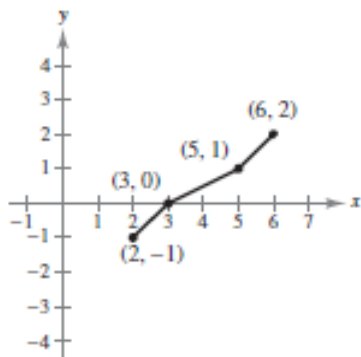
- A) $y = -x^3$
- B) $(x+1)^3 + 1$
- C) x^2
- D) $x^2 + 1$
- E) $-x^2 + 1$

Ans: A

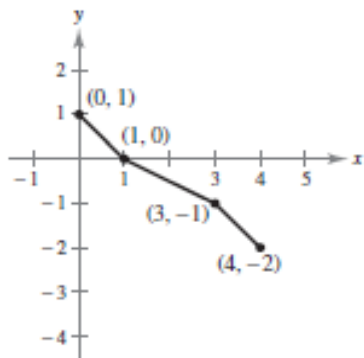
80. Use the graph of f to sketch the graph of $y = f(x) + 2$.



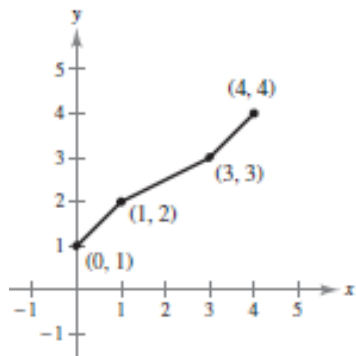
- A) Horizontal shift 2 units to the right



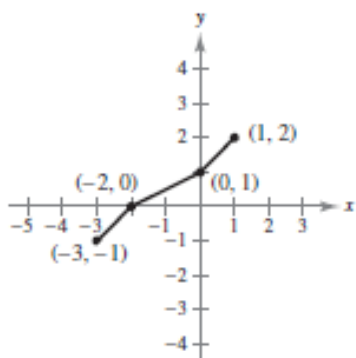
- B) Reflection in the x-axis



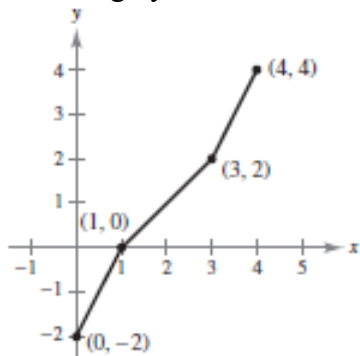
- C) Vertical shift 2 units upward



- D) Horizontal shift 3 units to the left

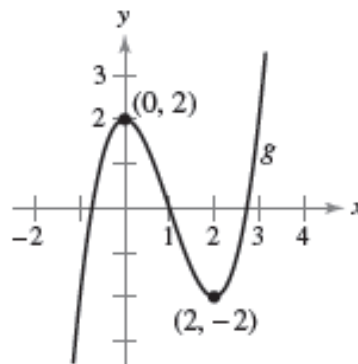
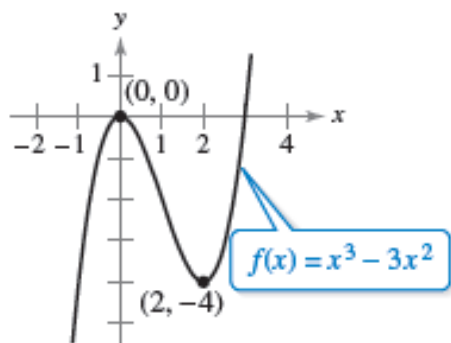


E) Stretching by 2



Ans: C

81. Use the graph of $f(x) = x^3 - 3x^2$ to write an equation for the function g .



- A) The graph is shifted 2 units upward, so $g(x) = x^3 - 3x^2 + 2$
- B) The graph is reflected in the x-axis and shifted 1 unit upward, so $g(x) = -x^3 + 3x^2 + 1$
- C) The graph is shifted 1 unit to the left, so $g(x) = x^3 - 3x - 2$
- D) The graph is shifted 2 unit to the left, so $g(x) = -x^3 + 3x^2 + 3x + 2$
- E) The graph is shifted 1 unit to the right $g(x) = x^3 + 3x + 1$

Ans: A

82. The point $(3, 9)$ on the graph of $f(x) = x^2$ has been shifted to the point $(4, 7)$ after a rigid transformation. Identify the shift and write the new function g in terms of f .

A) Shift: shifted 1 unit to the left.

$$h(x) = (x+1)^2$$

B) Shift: horizontally 3 units to the left and vertically 2 units downward.

$$h(x) = (x+3)^2 - 2$$

C) Shift: horizontally 2 units to the right and vertically 1 unit upward.

$$h(x) = (x-2)^2 + 1$$

D) Shift: horizontally 1 unit to the right and vertically 2 units downward.

$$h(x) = (x-1)^2 - 2$$

E) Shift: shifted 1 unit upward.

$$h(x) = x^2 + 1$$

Ans: D

83. Find $(f/g)(x)$.

$$f(x) = 4x^2 - 4x \qquad g(x) = 9 - x$$

A) $(f/g)(x) = \frac{4x^2 - 4x}{9 - x}, x \neq -9$

B) $(f/g)(x) = \frac{4x^2 - 4x}{9 - x}, x \neq 9$

C) $(f/g)(x) = \frac{4x^2 - 4x}{9 - x}, x \neq 0$

D) $(f/g)(x) = \frac{4x - 4}{9}, x \neq 0$

E) $(f/g)(x) = \frac{4x^2}{9} + 4, x \neq 0$

Ans: B

84. Find $(f+g)(x)$.

$$f(x) = -2x^2 - x - 7$$

$$g(x) = -x^2 - 4x + 7$$

A) $(f+g)(x) = -x^4 + 3x^2 - 14$

B) $(f+g)(x) = -3x^4 - 5x^2$

C) $(f+g)(x) = -x^2 + 3x - 14$

D) $(f+g)(x) = -3x^2 - 5x$

E) $(f+g)(x) = 3x^2 + 5x$

Ans: D

85. Find $(fg)(x)$.

$$f(x) = \sqrt{-3x} \qquad g(x) = \sqrt{-6x+2}$$

- A) $(fg)(x) = 3x\sqrt{2} - \sqrt{6x}$
- B) $(fg)(x) = 3x\sqrt{2-6x}$
- C) $(fg)(x) = \sqrt{-9x+2}$
- D) $(fg)(x) = \sqrt{18x^2+2}$
- E) $(fg)(x) = \sqrt{18x^2-6x}$

Ans: E

86. Find $(f-g)(x)$.

$$f(x) = -\frac{x}{9x-1} \qquad g(x) = \frac{7}{x}$$

- A) $(f-g)(x) = \frac{-x-7}{8x-1}$
- B) $(f-g)(x) = \frac{-x-64}{9x-1}$
- C) $(f-g)(x) = \frac{-x-62}{9x-1}$
- D) $(f-g)(x) = \frac{-x^2-63x-7}{9x^2-x}$
- E) $(f-g)(x) = \frac{-x^2-63x+7}{9x^2-x}$

Ans: E

87. Evaluate $(f+g)(-9)$ where $f(x) = x^2 + x - 20$ and $g(x) = 4x + 2$.

- A) -72
- B) 86
- C) 52
- D) -34
- E) 18

Ans: E

88. Evaluate $(f-g)(-3)$ where $f(x) = x^2 + 7x + 6$ and $g(x) = 3x + 5$.

- A) 8
- B) -2
- C) -14
- D) -6
- E) -10

Ans: B

89. Evaluate $(fg)(3)$ where $f(x) = x^2 + 13x + 30$ and $g(x) = 5x + 3$.

- A) -1404
- B) 324
- C) 1404
- D) 0
- E) 1173

Ans: C

90. Evaluate $\left(\frac{f}{g}\right)(-5)$ where $f(x) = x^2 - 17x - 18$ and $g(x) = -11x + 13$.

- A) $\frac{31}{34}$
- B) $\frac{23}{17}$
- C) $\frac{23}{2}$
- D) $\frac{55}{34}$
- E) $\frac{7}{68}$

Ans: B

91. Find $f \circ g$.

$$f(x) = 5x - 4 \qquad g(x) = x - 9$$

- A) $(f \circ g)(x) = 5x - 49$
- B) $(f \circ g)(x) = 5x - 13$
- C) $(f \circ g)(x) = 5x^2 - 49x + 36$
- D) $(f \circ g)(x) = 4x + 5$
- E) $(f \circ g)(x) = 4x - 13$

Ans: A

92. Find $g \circ f$.

$$f(x) = x - 7 \qquad g(x) = x^2$$

- A) $(g \circ f)(x) = x^2 - 7$
- B) $(g \circ f)(x) = x^2 - 49$
- C) $(g \circ f)(x) = x^2 + 49$
- D) $(g \circ f)(x) = x^2 - 7x + 49$
- E) $(g \circ f)(x) = x^2 - 14x + 49$

Ans: E

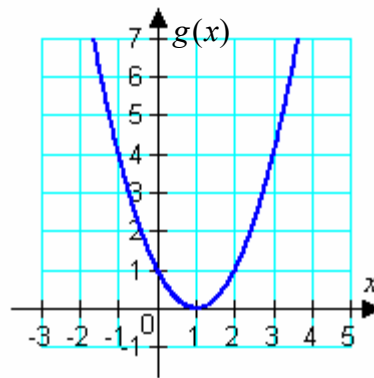
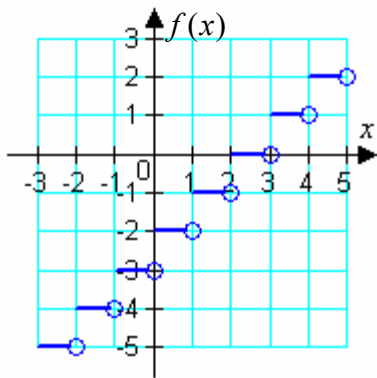
93. Determine the domain of $f \circ g$ if

$$f(x) = x^2 - 2 \quad \text{and} \quad g(x) = \sqrt{x}.$$

- A) $(-\infty, \infty)$
- B) $(-\infty, -2] \cup [2, \infty)$
- C) $(-\infty, -\sqrt{2}] \cup [\sqrt{2}, \infty)$
- D) $[\sqrt{2}, \infty)$
- E) $[0, \infty)$

Ans: C

94. Use the graphs of f and g to evaluate the function.



$$(f \circ g)(3)$$

- A) 1
- B) -2
- C) 4
- D) -1
- E) 2

Ans: E

95. The monthly cost C of running the machinery in a factory for t hours is given by

$$C(t) = 90t + 500.$$

The number of hours t needed to produce x products is given by

$$t(x) = 4x.$$

Find the equation representing the cost C of manufacturing x products.

- A) $C(x) = 360x + 500$
- B) $C(x) = 360x + 45,000$
- C) $C(x) = 94x + 500$
- D) $C(x) = 94x + 590$
- E) $C(x) = 90x + 504$

Ans: A

96. You own two fast-food restaurants. During the years 2000 to 2008, the sales for the first restaurant have been increasing according to the function

$$R_1 = 311 + 11.3t, \quad t = 0, 1, 2, 3, 4, 5, 6, 7, 8$$

where R_1 represents the sales (in thousands of dollars) and t represents the year, with $t = 0$ corresponding to 2000. During the same nine-year period, the sales for the second restaurant have been decreasing according to the function

$$R_2 = 463 - 17.4t, \quad t = 0, 1, 2, 3, 4, 5, 6, 7, 8.$$

Write a function that represents the total sales for the two restaurants to determine whether the total sales have been increasing or decreasing.

- A) $R_T = -152 - 6.1t$, total sales have been decreasing.
- B) $R_T = 774 + 6.1t$, total sales have been increasing.
- C) $R_T = 774 - 6.1t$, total sales have been decreasing.
- D) $R_T = -152 + 28.7t$, total sales have been increasing.
- E) $R_T = 152 - 28.7t$, total sales have been decreasing.

Ans: C

97. A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius (in feet) of the outermost ripple is given by

$$r(t) = 1.2t$$

where t is time in seconds after the pebble strikes the water. The area of the outermost circle is given by the function

$$A(r) = \pi r^2.$$

Find and interpret $(A \circ r)(t)$.

- A) $(A \circ r)(t) = \pi t^2$; $A \circ r$ represents the area of the circle at time t .
- B) $(A \circ r)(t) = 1.2\pi t^2$; $A \circ r$ represents the radius of the circle at time t .
- C) $(A \circ r)(t) = 1.44\pi t^2$; $A \circ r$ represents the radius of the circle at time t .
- D) $(A \circ r)(t) = 1.44\pi t^2$; $A \circ r$ represents the area of the circle at time t .
- E) $(A \circ r)(t) = 1.2\pi t^2$; $A \circ r$ represents the area of the circle at time t .

Ans: D