Calculus An Applied Approach 9th Edition Larson Test Bank
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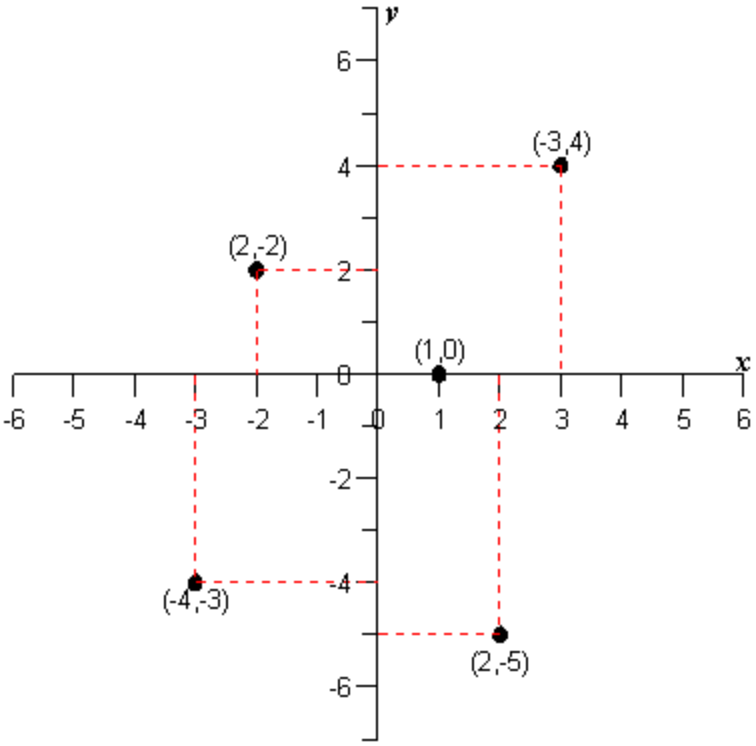
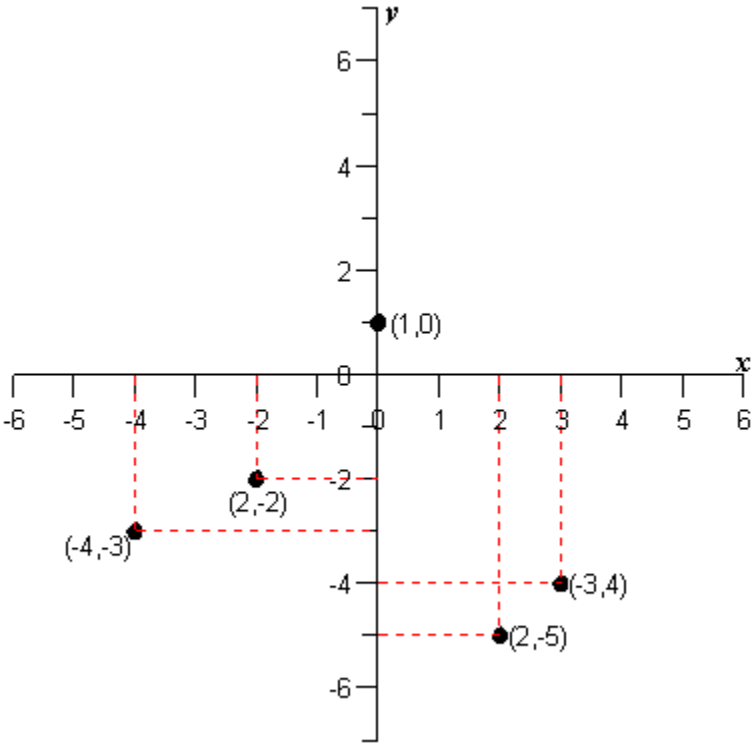
Chapter 1: Functions, Graphs, and Limits

1. Plot the points $(-4, 2), (3, -3), (-5, -2), (4, 0), (3, -4)$ in the Cartesian plane.

A)



B)



C)

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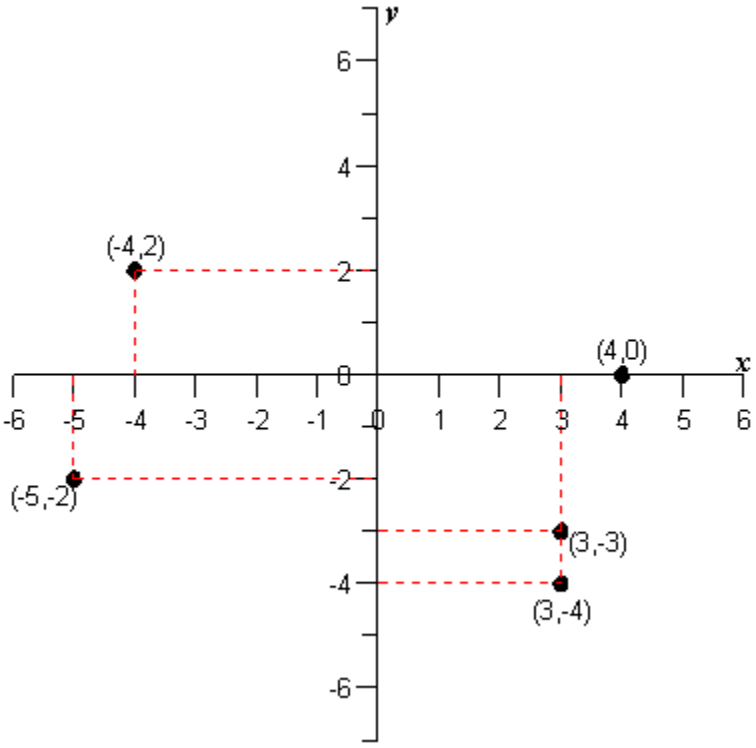
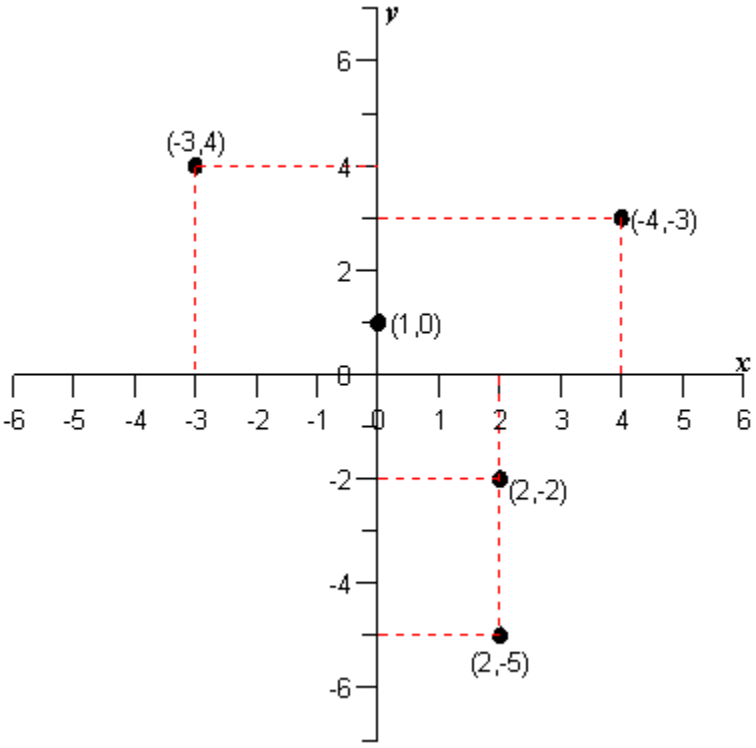
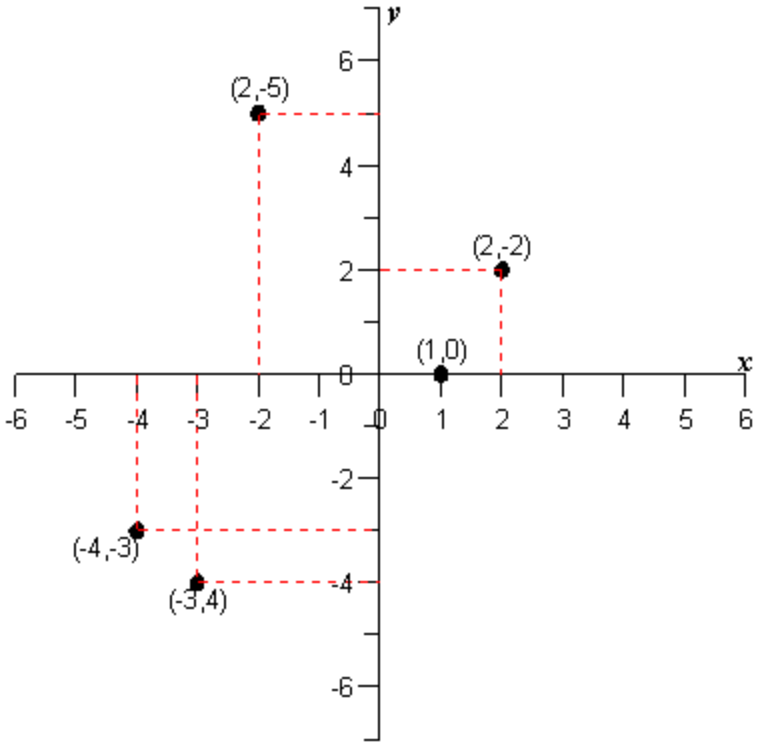
D)



E)



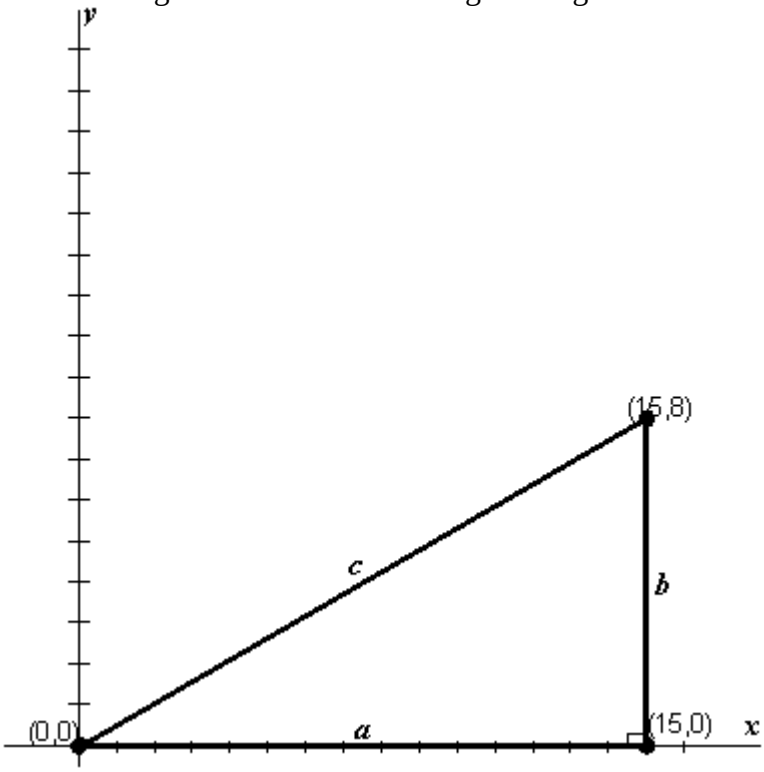


Ans: C

2. Find the distance between the points $(3,4)$ and $(7,7)$. Round your answer to the nearest hundredth.
   A) 25.00
   B) 2.65
   C) 5.00
   D) 14.87
   E) 4.58
   Ans: C

3. Find the midpoint of the line segment joining the points $(5,1)$ and $(7,7)$. Round your answer to the nearest hundredth.
   A) $(12,28)$
   B) $(6,4)$
   C) $(-1,-3)$
   D) $(3,7)$
   E) none of these choices
   Ans: B

4. Find the length of each side of the right triangle from the following figure.



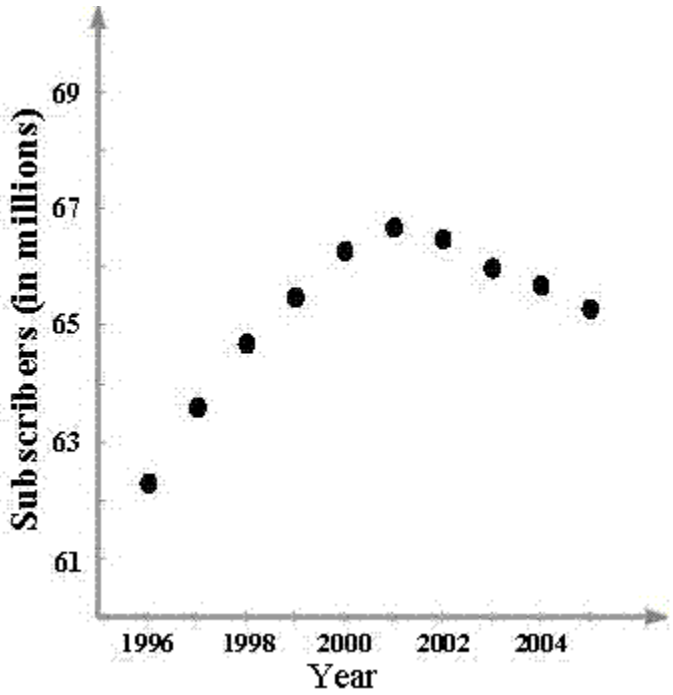
A) $a = 15, b = 8, c = 17$
B) $a = 8, b = 15, c = 17$
C) $a = 17, b = -8, c = 15$
D) $a = 15, b = 8, c = -17$
E) $a = 15, b = 15, c = 17$
Ans: A

5. Find x such that the distance between the points $(5, 2)$ and $(x, 8)$ is 10.
A) $x = 13$ or $x = -13$
B) $x = -3$ or $x = 3$
C) $x = 13$ or $x = -3$
D) $x = -11$ or $x = 11$
E) $x = 15$ or $x = -15$
Ans: C

6. Assume that the number (in millions) of basic cable television subscribers in the United States from 1996 through 2005 is given in the following table. Use a graphing utility to graph a scatter plot of the given data. Describe any trends that appear within the last four years.

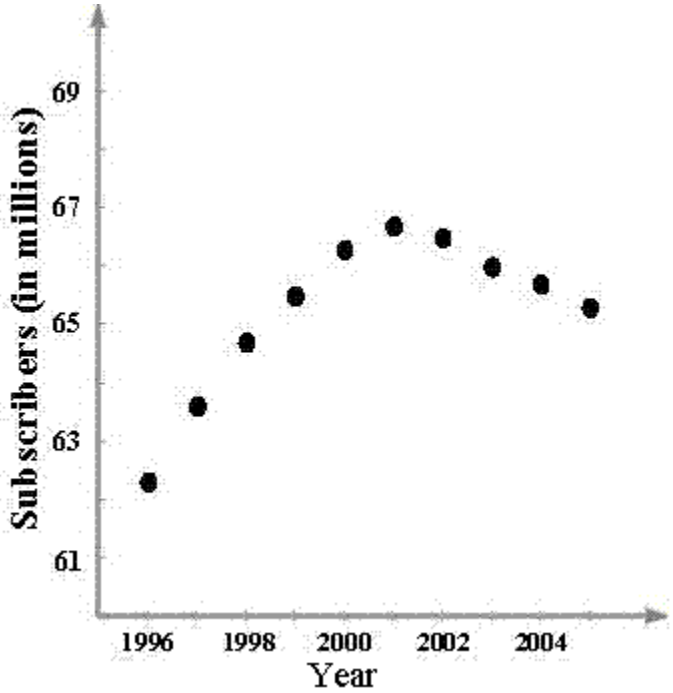
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	
Subscribers	62.3	63.6	64.7	65.5	66.3	66.7	66.5	66.0	65.7	

A)



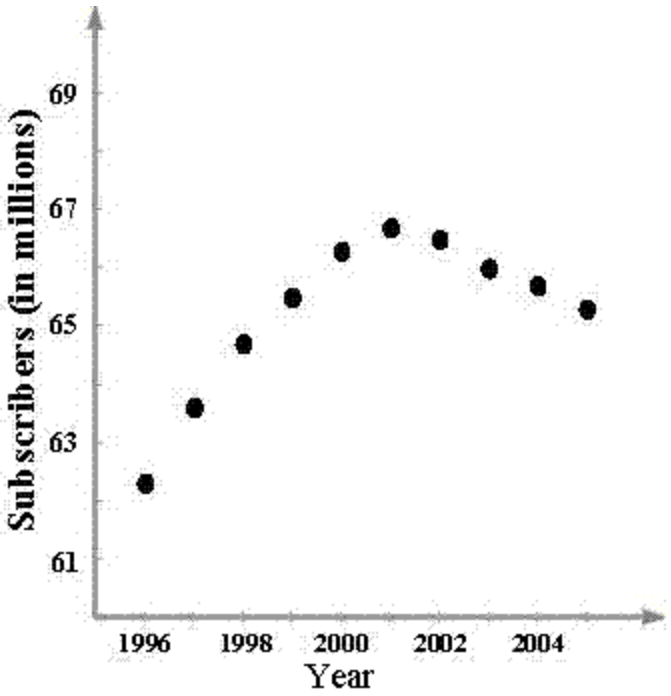
The number of subscribers appears to be increasing.

B)



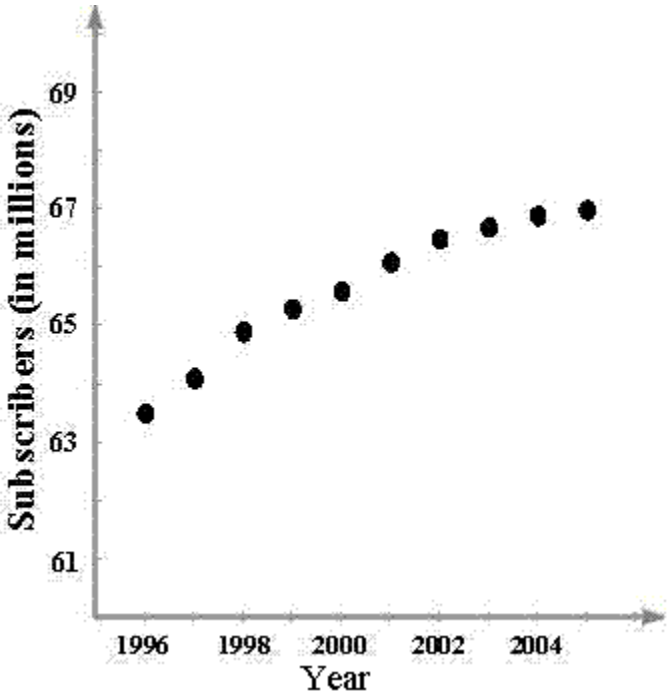
The number of subscribers appears to be decreasing.

C)



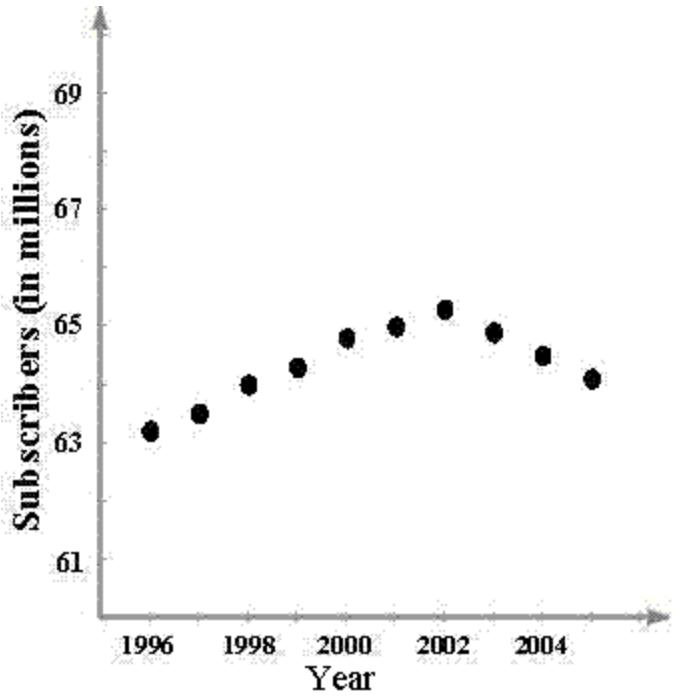
The number of subscribers appears to be linearly decreasing.

D)



The number of subscribers appears to be decreasing.

E)



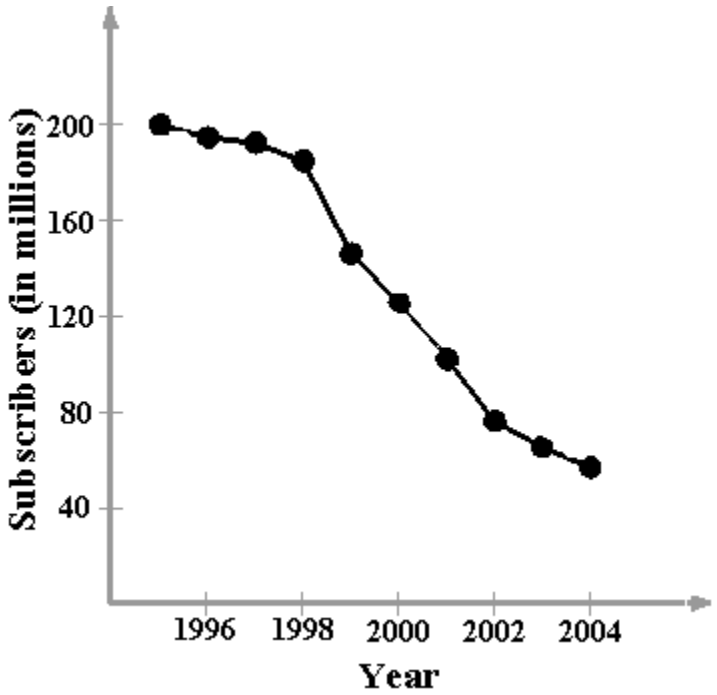
The number of subscribers appears to be linearly increasing.

Ans: B

7. Assume that the number (in millions) of cellular telephone subscribers in the United States from 1996 through 2005 is given in the following table. Use a graphing utility to graph a line plot of the given data. Describe any trends that appear within the last four years.

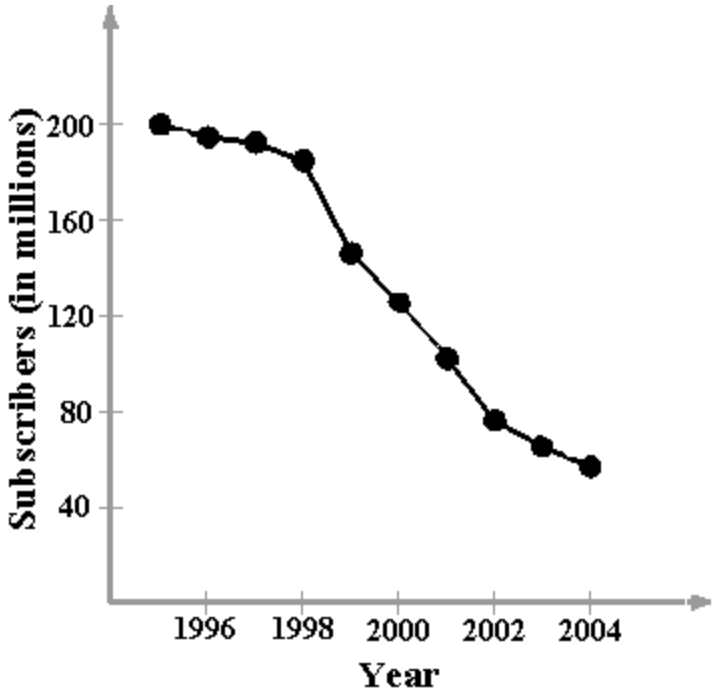
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Subscribers	200.5	195.1	192.9	185.3	146.6	125.6	102.5	76.7	65.9	57.3

A)



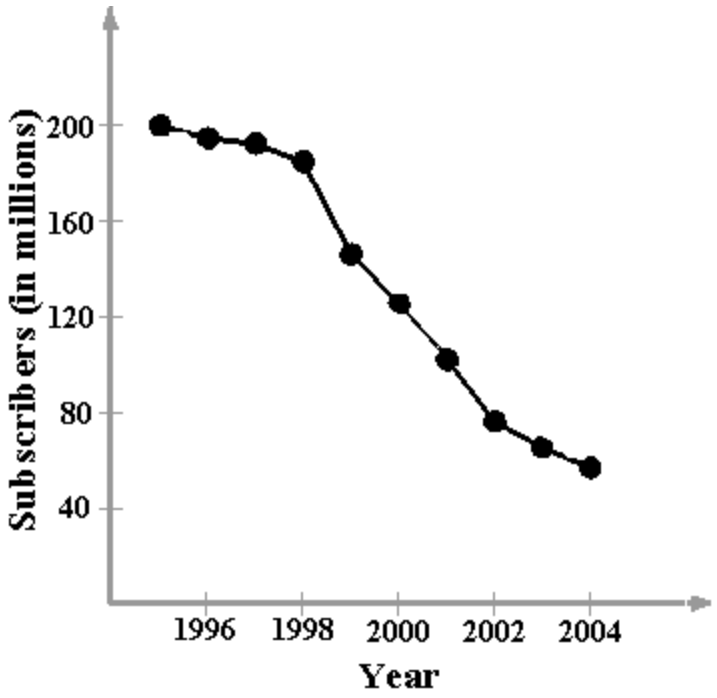
The number of subscribers appears to be decreasing.

B)



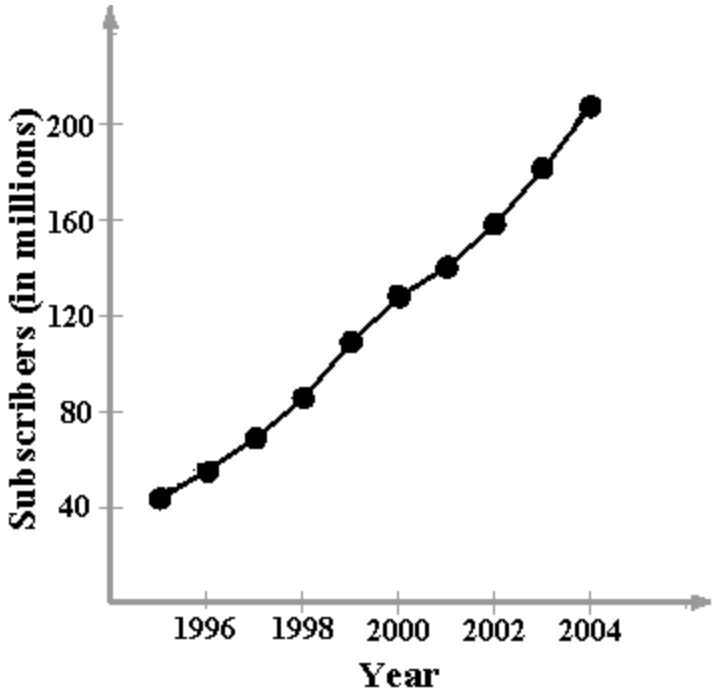
The number of subscribers appears to be increasing.

C)



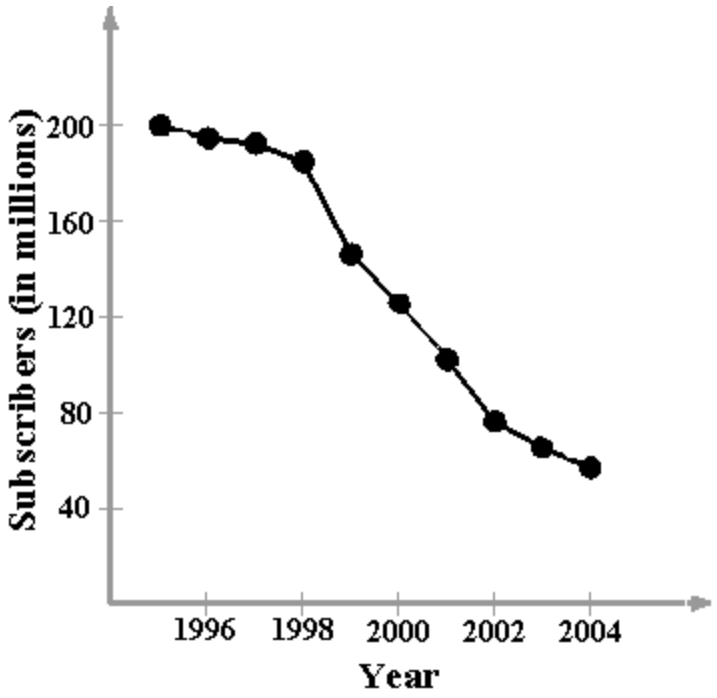
The number of subscribers appears to be constant.

D)



The number of subscribers appears to be decreasing.

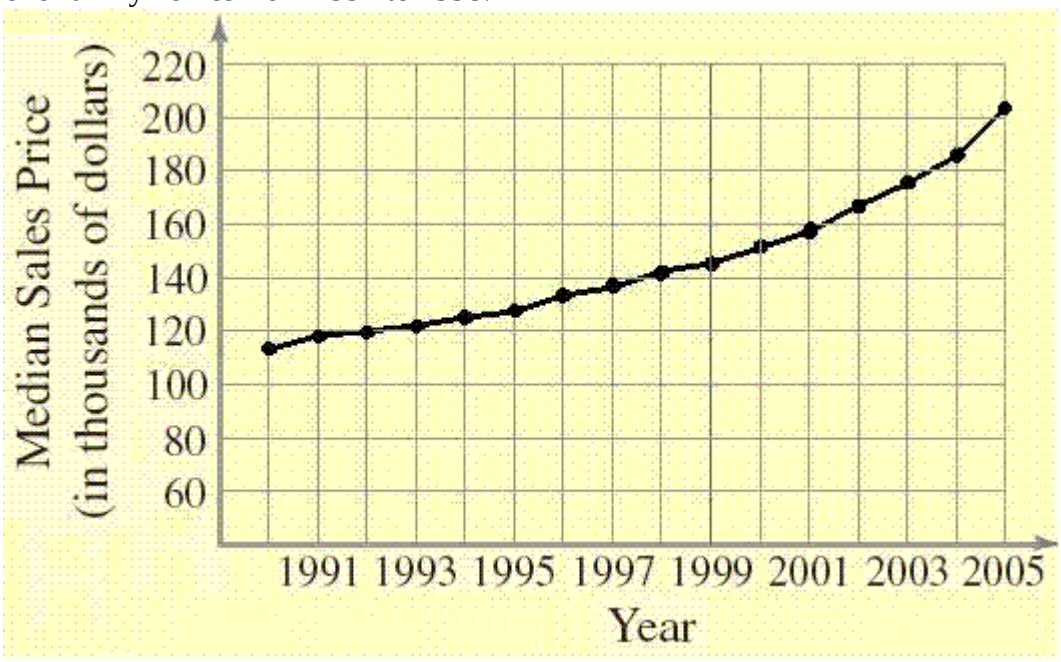
E)



The number of subscribers appears to be increasing linearly.

Ans: A

8. Assume that the median sales prices of existing one family homes sold (in thousands of dollars) in the United States from 1990 through 2005 are as given in the following figure. Use the following figure to estimate the percent increase in the value of existing one-family homes from 1997 to 1998.



A) 0.021%
B) 0.058%
C) 2.06%
D) 55.5%
E) 5.8%
Ans: E

9. Use the Midpoint Formula repeatedly to find the three points that divide the segment joining (x_1, y_1) and (x_2, y_2) into four equal parts.

A) $\left(\frac{3x_1+x_2}{2}, \frac{3y_1+y_2}{2}\right), \left(\frac{x_1+x_2}{4}, \frac{y_1+y_2}{4}\right), \left(\frac{x_1+3x_2}{4}, \frac{y_1+3y_2}{4}\right)$

B) $\left(\frac{3x_1+x_2}{4}, \frac{3y_1+y_2}{4}\right), \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right), \left(\frac{x_1+3x_2}{4}, \frac{y_1+3y_2}{4}\right)$

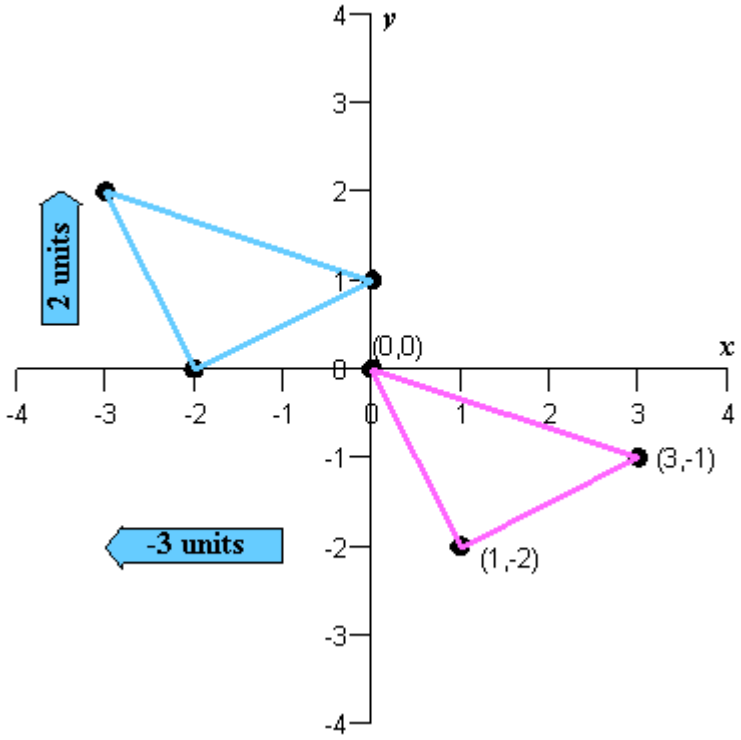
C) $\left(\frac{3x_1+x_2}{2}, \frac{y_1+y_2}{2}\right), \left(\frac{x_1+3x_2}{4}, \frac{y_1+3y_2}{4}\right), \left(\frac{x_1+3x_2}{4}, \frac{y_1+3y_2}{4}\right)$
$\left(\frac{3x_1+x_2}{2}, \frac{y_1+y_2}{2}\right), \left(\frac{x_1+3x_2}{4}, \frac{y_1+3y_2}{4}\right), \left(\frac{x_1+x_2}{4}, \frac{y_1+y_2}{4}\right)$

D) $\left(\frac{3x_1+x_2}{2}, \frac{y_1+4y_2}{2}\right), \left(\frac{x_1+4x_2}{4}, \frac{y_1+4y_2}{4}\right), \left(\frac{x_1+4x_2}{4}, \frac{y_1+4y_2}{4}\right)$

E) $\left(\frac{x_1+x_2}{4}, \frac{y_1+y_2}{2}\right), \left(\frac{x_1+x_2}{4}, \frac{y_1+y_2}{2}\right), \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{4}\right)$

Ans: B

10. The red figure is translated to a new position in the plane to form the blue figure. Find the vertices of the transformed figure from the following graph. (In case your exam is printed in black and white - the red figure has one vertex at (0,0)).

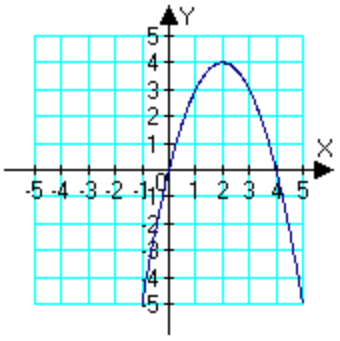


A) $(-2,0),(-3,2),(1,0)$
B) $(-2,0),(-3,2),(0,1)$
C) $(-2,0),(-3,1),(0,1)$
D) $(-2,-3),(-3,2),(0,0)$
E) $(-2,0),(-3,0),(0,1)$

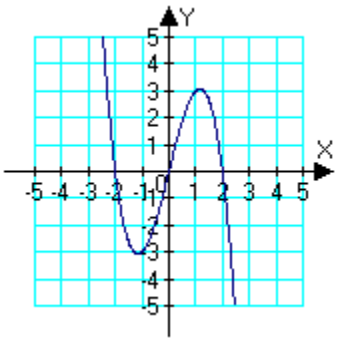
Ans: B

11. Which of the following is the correct graph of $y = 4 - x$?

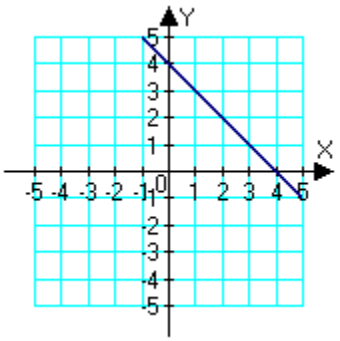
A)



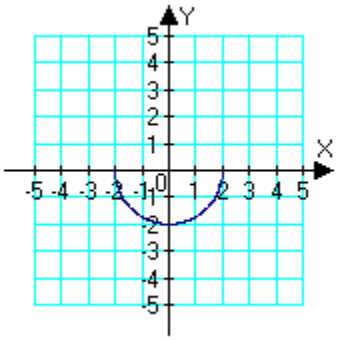
B)



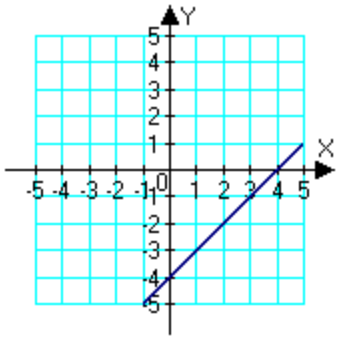
C)



D)



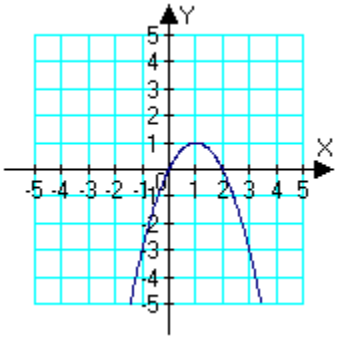
E)



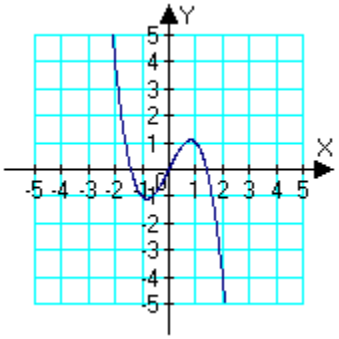
Ans: C

12. Which of the following is the correct graph of $y = 2x - x^2$?

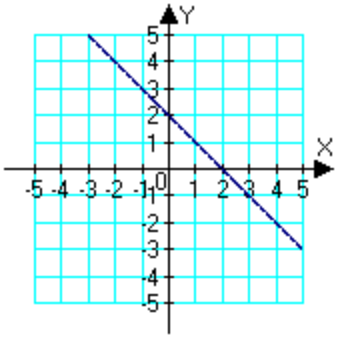
A)



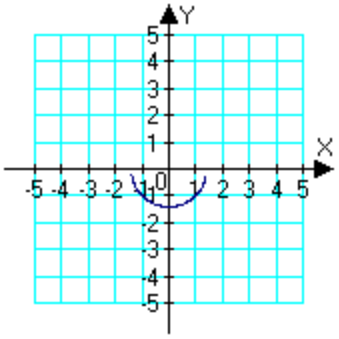
B)



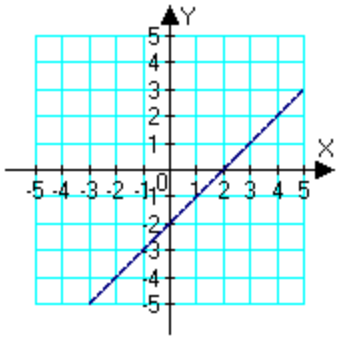
C)



D)



E)

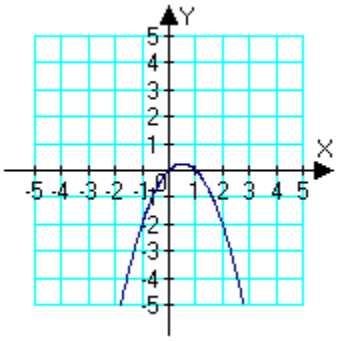


Ans: A

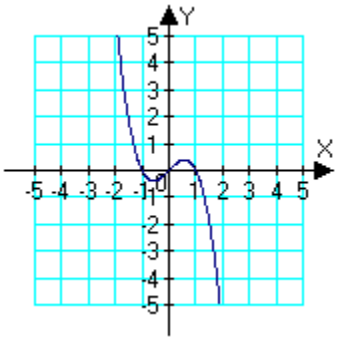
13. Which of the following is the correct graph of the given equation?

$y = -\sqrt{1 - x^2}$

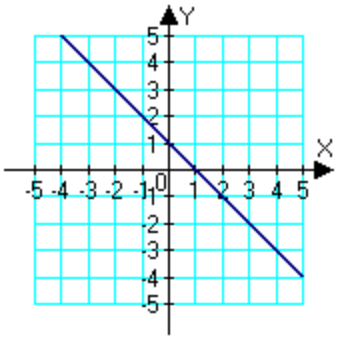
A)



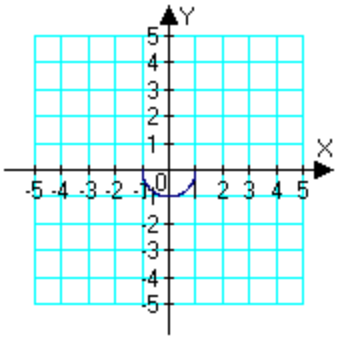
B)



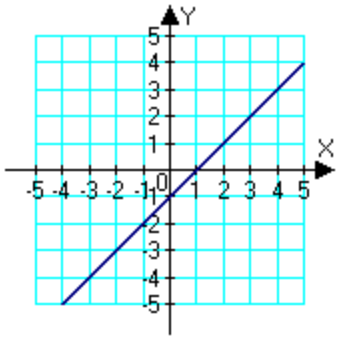
C)



D)



E)

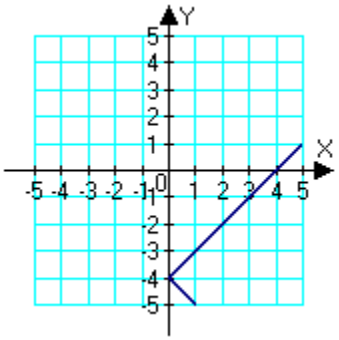


Ans: D

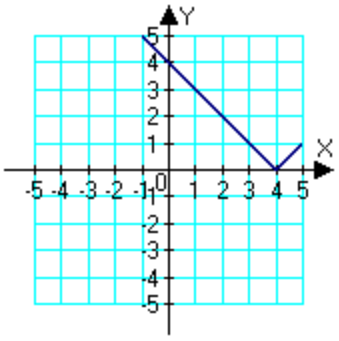
14. Sketch the graph of the equation.

$y = |x + 4|$

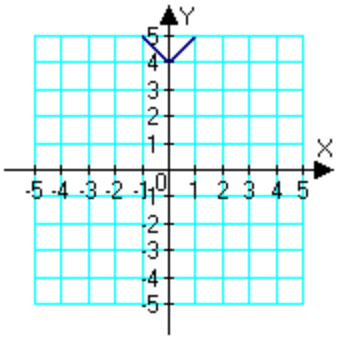
A)



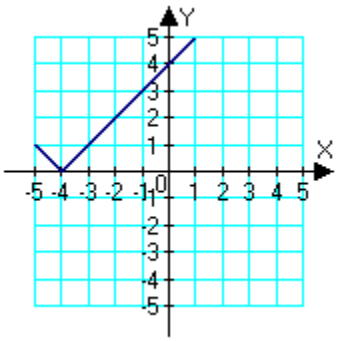
B)



C)



D)

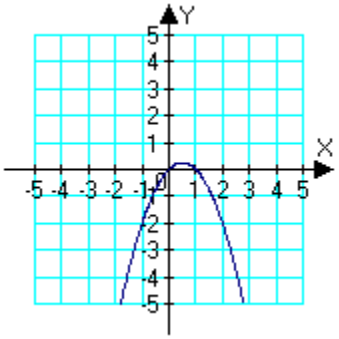


E) None of the above

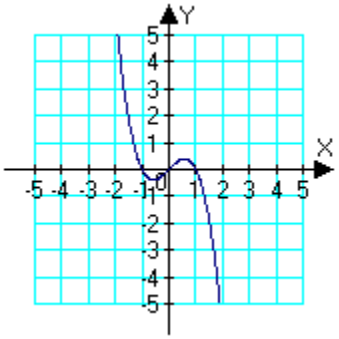
Ans: D

15. Which of the following is the correct graph of $y = x - x^3$?

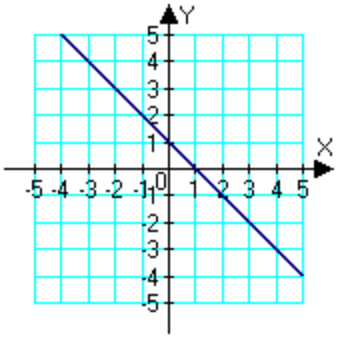
A)



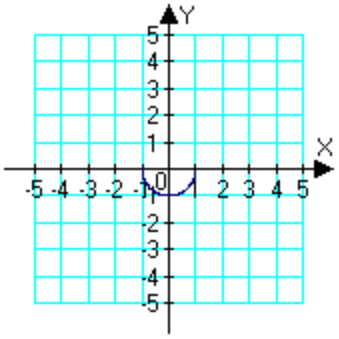
B)



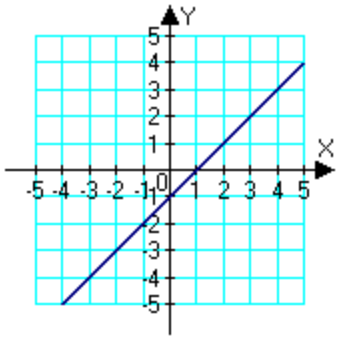
C)



D)



E)



Ans: B

16. Find the *x*- and *y*- intercepts of the graph of the equation $y = \sqrt{16 - x^2}$.

A) *x*-intercepts: $(4, 0)$, $(-4, 0)$; *y*-intercepts: $(0, 4)$

B) *x*-intercepts: $(0, 4)$, $(0, -4)$; *y*-intercepts: $(4, 0)$

C) *x*-intercepts: $(0, 16)$, $(0, -16)$; *y*-intercepts: $(16, 0)$, $(-16, 0)$

D) *x*-intercepts: $(0, 16)$, $(0, 4)$; *y*-intercepts: $(16, 0)$, $(4, 0)$

E) *x*-intercept: $(4, 0)$; *y*-intercept: $(0, 4)$

Ans: A

17. Find the *x*- and *y*- intercepts of the graph of the equation $y = \dfrac{x^2 - 36}{x + 6}$.

A) *x*-intercept: $(-6, 0)$; *y*-intercept: $(0, 6)$

B) *x*-intercepts: $(6, 0)$, $(-6, 0)$; *y*-intercepts: $(0, -6)$, $(0, 6)$

C) *x*-intercept: $(6, 0)$; *y*-intercept: $(0, -6)$

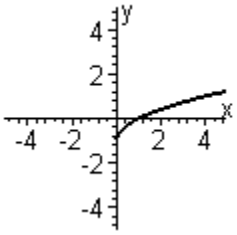
D) *x*-intercepts: $(0, -6)$, $(0, 6)$; *y*-intercepts: $(6, 0)$, $(-6, 0)$

E) *x*-intercept: $(36, 0)$; *y*-intercept: $(0, 36)$

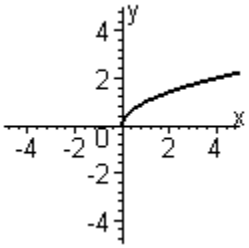
Ans: C

18. Sketch the graph of the function $y = \sqrt{x} - 1$.

A)



B)



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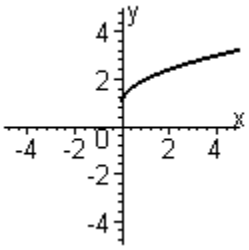

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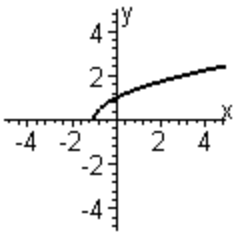
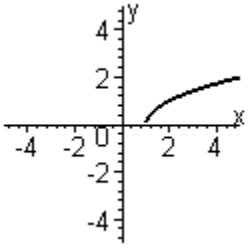


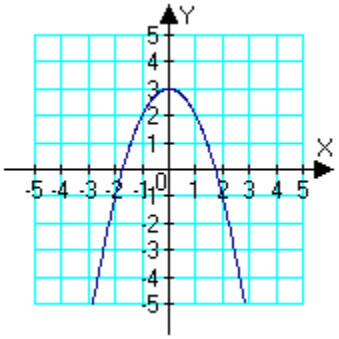
E)



Ans: A

19. Sketch the graph of the equation: $x = 3 - y^2$.

A)



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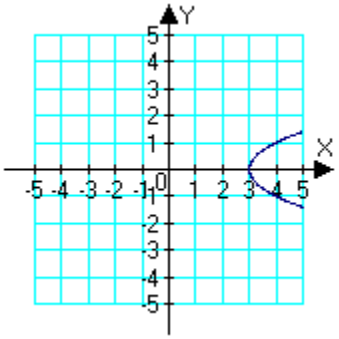
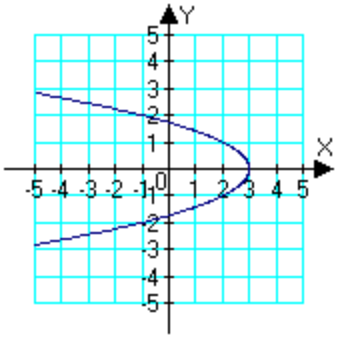
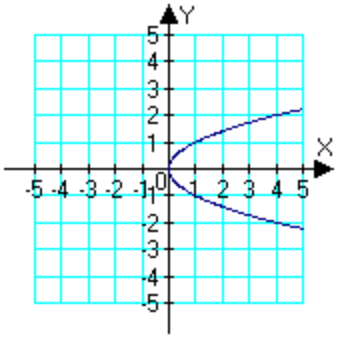


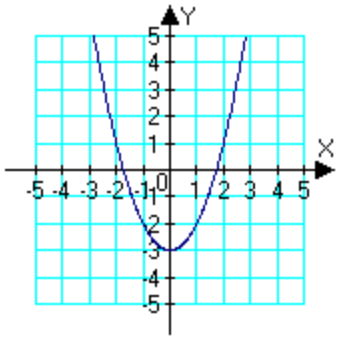
C)



D)



E)



Ans: C

20. Write the general form of the equation of the circle with center $(4,6)$ and solution point $(0,0)$.

A) $x^2 - y^2 - 8y - 12x = 0$

B) $x^2 + y^2 - 8y + 12x = 0$

C) $x^2 - y^2 - 8x - 12y = 0$

D) $x^2 + y^2 + 8x - 12y = 0$

E) $x^2 + y^2 - 8x - 12y = 0$

Ans: E

21. Write the general form of the equation of the circle with endpoints of a diameter at $(0,0)$ and $(-14,18)$.

A) $x^2 - y^2 + 14y - 18x = 0$

B) $x^2 + y^2 + 14y + 18x = 0$

C) $x^2 - y^2 + 14x - 18y = 0$

D) $x^2 + y^2 - 14x - 18y = 0$

E) $x^2 + y^2 + 14x - 18y = 0$

Ans: E

22. Find the points of intersection (if any) of the graphs of the equations $2x + y = -20$ and $6x - 4y = -32$.

A) $(-8,-4)$

B) $(-4,-8)$

C) $(8,-4)$

D) $(-4,8)$

E) $(8,4)$

Ans: A

23. A manufacturer of DVD players has monthly fixed costs of $8600 and variable costs of $75 per unit for one particular model. For this model DVD player, find the function $C(x)$ for monthly total costs where *x* denotes the number of units produced and sold..

A) $C(x) = 75x - 8600$

B) $C(x) = 75x + 8600$

C) $C(x) = 100x + 8600$

D) $C(x) = 100x$

E) $C(x) = 25x - 8600$

Ans: B

24. A small business recaps and sells tires. The business has a revenue function $R(x) = 115x$ and a cost function $C(x) = 3500 + 80x$, where *x* represents the number of sets of four tires recapped and sold. Find the number of sets of recaps that must be sold to break even.

A) 100
B) 500
C) 35
D) 700
E) 80

Ans: A

25. Find the market equilibrium point for the following demand and supply functions below, where *p* is price per unit and *q* is the number of units produced and sold.

Demand: $p = -2q + 320$

Supply: $p = 6q + 2$

A) $q = 39.75, p = 240.50$

B) $q = 79.50, p = 161.00$

C) $q = 40.25, p = 239.50$

D) $q = 80.50, p = 159.00$

E) $q = 40.00, p = 240.00$

Ans: A

26. Find the equilibrium point for the following supply and demand functions below, where *p* is price per unit and *q* is the number of units produced and sold.

Demand: $p = 520 - 3q$

Supply: $p = 17q + 80$

A) $q = 30, p = \$430$

B) $q = 60, p = \$340$

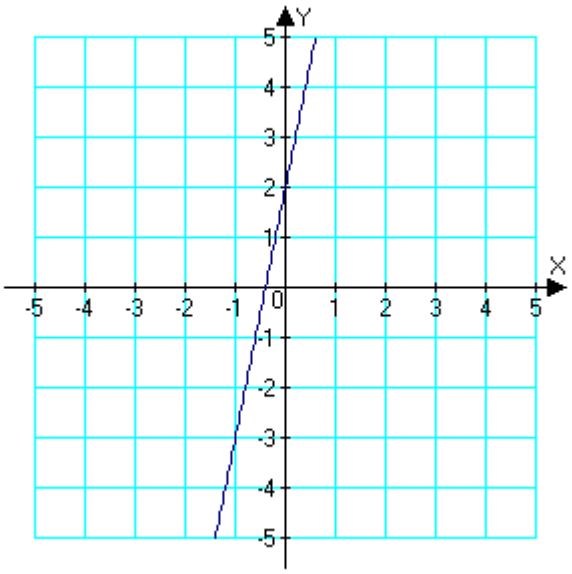
C) $q = 44, p = \$388$

D) $q = 22, p = \$454$

E) $q = 26, p = \$442$

Ans: D

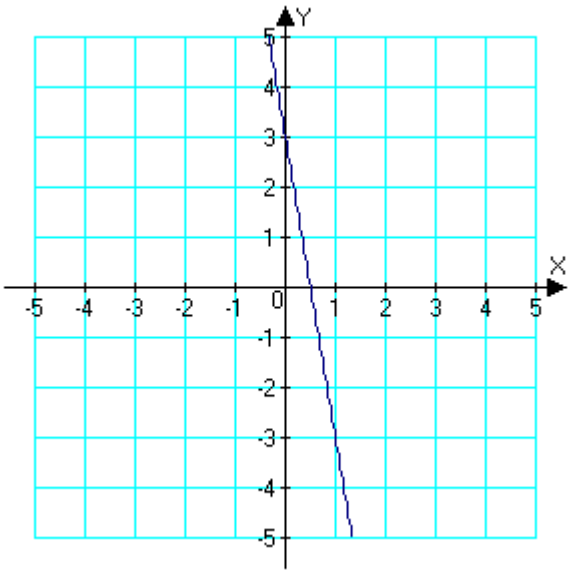
27. Estimate the slope of the line from the graph.



A) $\frac{1}{5}$
B) 2
C) 5
D) $-\frac{1}{5}$
E) $-\frac{1}{2}$

Ans: C

28. Estimate the slope of the line from the graph.



A) $-\frac{1}{6}$
B) 6
C) $\frac{1}{6}$
D) –6
E) None of the above
Ans: D

29. Find the slope of the line passing through the pair of points.
$(-8,5),(6,-12)$
A) $\frac{17}{14}$
B) $-\frac{17}{14}$
C) $\frac{14}{17}$
D) $-\frac{14}{17}$
E) None of the above
Ans: B

30. Find the slope of the line passing through the given pair of points.

$(7,4)$ and $(7,-4)$

A) -8
B) $-\frac{1}{7}$
C) -7
D) 0
E) The slope is undefined.
Ans: E

31. Find the slope of the line passing through the given pair of points.

$(17,-43)$ and $(23,-25)$

A) -18
B) $\frac{1}{3}$
C) 3
D) $-\frac{1}{3}$
E) The slope is undefined.
Ans: C

32. Find the slope of the line passing through the given pair of points.

$(-3,10)$ and $(-14,-1)$

A) $-\frac{1}{11}$
B) 1
C) -11
D) -17
E) The slope is undefined.
Ans: B

33. Use the point $(3,5)$ on a line having slope $m=-4$ to find two additional points through which the line passes.

A) $(-4,33),(2,9)$
B) $(-4,-33),(2,9)$
C) $(-4,33),(2,-9)$
D) $(-4,-33),(2,-9)$
E) $(-4,33),(-2,-9)$
Ans: A

34. Find the slope m and y-intercept b of the line whose equation is given below.

$y = \frac{3}{2}x - \frac{1}{5}$

A) $m = -\frac{1}{5},\ b = \frac{3}{2}$

B) $m = \frac{2}{3},\ b = -\frac{1}{5}$

C) $m = \frac{3}{2},\ b = -\frac{1}{5}$

D) $m = \frac{3}{2},\ b = \frac{1}{5}$

E) $m = -\frac{3}{2},\ b = \frac{1}{5}$

Ans: C

35. Find the slope m and y-intercept b of the line whose equation is given below.

$2x + 5y = 10$

A) $m = -\frac{2}{5},\ b = -5$

B) $m = -\frac{2}{5},\ b = 2$

C) $m = \frac{5}{2},\ b = 5$

D) $m = \frac{2}{5},\ b = 2$

E) $m = -\frac{5}{2},\ b = -2$

Ans: B

36. Find the slope m and y-intercept b of the line whose equation is given below.

$x = -\frac{1}{3}$

A) $m = -\frac{1}{3},\ \ b = 0$

B) $m = 0,\ \ b = 0$

C) $m = -\frac{1}{3},\ \ b = \frac{1}{3}$

D) $m = 0,\ \ b = -\frac{1}{3}$

E) Both m and b are undefined.

Ans: E

37. Find the slope m and y-intercept b of the line whose equation is given below.

$y = -5$

A) $m = -5, \quad b = 0$

B) $m = 0, \quad b = 0$

C) $m = -5, \quad b = 5$

D) $m = 0, \quad b = -5$

E) Both m and b are undefined.

Ans: D

38. Write the equation of the line passing through the given pair of points.

$(-6, 5)$ and $(5, 6)$

A) $y = x - 1$

B) $y = \frac{1}{11}x + \frac{61}{11}$

C) $y = -\frac{1}{11}x + 61$

D) $y = -x + 11$

E) $y = \frac{1}{11}x + \frac{11}{61}$

Ans: B

39. Write the equation of the line passing through the given pair of points.

$(3, 10)$ and $(9, 4)$

A) $y = -x + 13$

B) $y = -5x + 13$

C) $y = -13x + 13$

D) $y = -x - 5$

E) $y = x - 5$

Ans: A

40. Find an equation of the line that passes through the points $\left(-\frac{9}{2}, \frac{5}{4}\right)$ and $\left(-\frac{10}{11}, -\frac{16}{3}\right)$.

A) $y = -\frac{11}{6}x$

B) $y = -\frac{11}{6}x - 7$

C) $y = -\frac{11}{6}x - 14$

D) $y = -\frac{11}{6}x + 7$

E) $y = -\frac{11}{6}x + 14$

Ans: B

41. Find an equation of the line that passes through the point (–6,12) and has the slope *m* that is undefined.

A) $y = -6$

B) $x = -6$

C) $y = 12$

D) $x = 12$

E) $y = -6x$

Ans: B

42. Write the equation and graph the line that passes through the given point and has the slope indicated.

$(-4, -4)$ with 0 slope

A) $y = x + 4$

B) $y = -4$

C) $y = x$

D) $x = 4$

E) $y = x - 4$

Ans: B

43. Write the equation of the line that passes through the given point and has the slope indicated.

$(-4, -1)$ with slope $-\frac{3}{5}$

A) $y = -\frac{3}{5}x - 17$

B) $y = -\frac{3}{5}x - \frac{17}{5}$

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

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

E) $y = -\frac{3}{5}x + \frac{17}{5}$

Ans: B

44. True or False: These three points are collinear.
(1, 3), (0, 2), (–2, 1)

A) true

B) false

Ans: B

45. Write the equation of the line through $(-7, -3)$ that is parallel to $4x - 5y = 6$.

A) $y = -\frac{5}{4}x + \frac{23}{5}$

B) $y = \frac{4}{5}x + \frac{13}{5}$

C) $y = \frac{4}{5}x - \frac{23}{5}$

D) $y = \frac{4}{5}x + 23$

E) $y = -\frac{4}{5}x - \frac{13}{5}$

Ans: B

46. Write the equation of the line through $(-4,-7)$ that is perpendicular to $x = 4y + 8$.

A) $y = \frac{1}{4}x - 23$

B) $y = 4x + 9$

C) $y = -4x + 23$

D) $y = \frac{1}{4}x - 9$

E) $y = -4x - 23$

Ans: E

47. Write an equation of the line that passes through the point (i) parallel to the given line, and (ii) perpendicular to the given line.

Point Line

$(-5,4)$ $-3x - 9y = -12$

A) (i) parallel: $-3x - 9y = -57$
(ii) perpendicular: $9x - 3y = -21$

B) (i) parallel: $-3x - 9y = -21$
(ii) perpendicular: $9x - 3y = -57$

C) (i) parallel: $3x - 9y = -21$
(ii) perpendicular: $-9x - 3y = -57$

D) (i) parallel: $-3x + 9y = 51$
(ii) perpendicular: $9x - 3y = -57$

E) (i) parallel: $3x - 9y = -57$
(ii) perpendicular: $-3x - 9y = -21$

Ans: B

48. Write an equation of the line that passes through the point (i) parallel to the given line, and (ii) perpendicular to the given line.

Point Line

$(3,-6)$ $x = -8$

A) (i) parallel: $x = 3$
(ii) perpendicular: $y = -6$

B) (i) parallel: $y = -6$
(ii) perpendicular: $x = 3$

C) (i) parallel: $x = -6$
(ii) perpendicular: $y = 3$

D) (i) parallel: $x = -3$
(ii) perpendicular: $y = 6$

E) (i) parallel: $y = 6$
(ii) perpendicular: $x = 3$

Ans: A

49. Find a linear equation that expresses the relationship between the temperature in degrees Celsius and degrees Fahrenheit. Use the fact that water freezes at $0°C$ $(32°F)$ and boils at $100°C$ $(212°F)$. Use the equation to convert $76°F$ to Celsius.
A) $24°C$
B) $10°C$
C) $60°C$
D) $79°C$
E) $105°C$
Ans: A

50. Suppose the resident population of South Carolina (in thousands) was 4020 in 2000 and 4257 in 2007. Assume that the relationship between the population y and the year t is linear. Let $t = 0$ represent 2000. Estimate the population in 2004 by using linear model for the given data. Round your answer to the nearest thousand residents.
A) 4336 thousand residents
B) 3885 thousand residents
C) 4122 thousand residents
D) 4155 thousand residents
E) 4392 thousand residents
Ans: D

51. In 2004, a product has a value of \$2875. Over the next five years, its value will increase by \$150 per year. Write a linear equation that gives the dollar value V in terms of the year t. (Let $t = 0$ represent 2000.)
A) $V = 150t + 2875$
B) $V = 150t - 2875$
C) $V = 150t + 2275$
D) $V = 150t + 3475$
E) $V = 150t - 2275$
Ans: C

52. A small business purchases a piece of equipment for \$1030. After 10 years, the equipment will be outdated, having no value. Write a linear equation giving the value V of the equipment in terms of time t in years, $0 \le t \le 10$.
A) $V = -103t - 1030$
B) $V = 103t + 1030$
C) $V = 103t - 1030$
D) $V = -103t + 1030$
E) $V = -103t + 103$
Ans: D

53. If $y^2 = 8x^2$, is y a function of x?
A) Yes
B) No
Ans: B

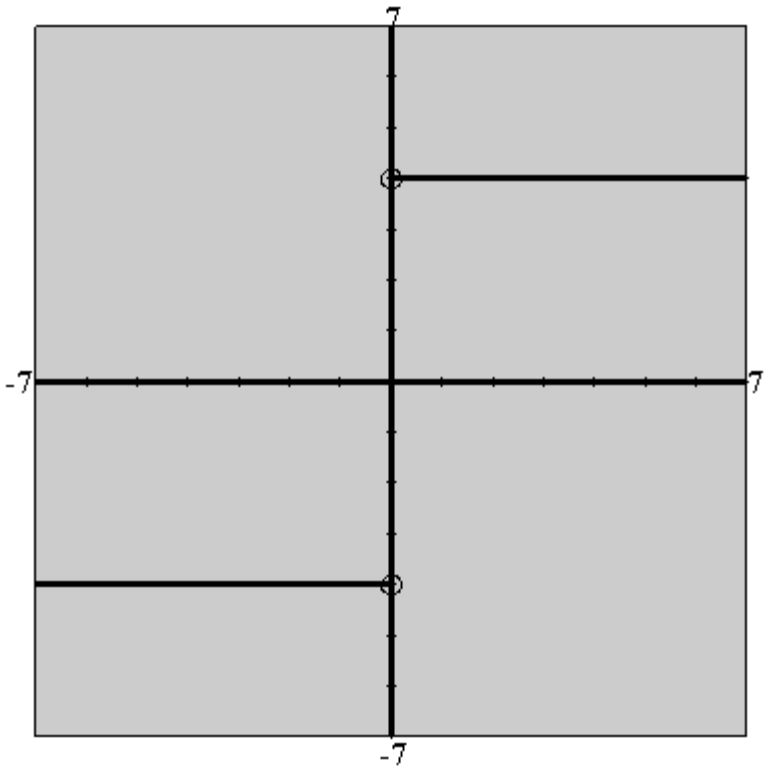
54. If $y^2 = 3x$, is y a function of x?
A) Yes
B) No
Ans: B

55. Determine whether y is a function of x.
$y - 8x^2 = 5$
A) Yes
B) No
Ans: A

56. Determine whether y is a function of x.
$xy - x^2 = 9y + x$
A) No
B) Yes
Ans: B

57. Determine the range of the function $f(x) = 5x^2 - 10x + 9$.
A) $[4, \infty)$
B) $(6, \infty)$
C) $(-\infty, 1]$
D) $(-\infty, -1)$
E) $(-\infty, \infty)$
Ans: A

58. Determine the range of the function $f(x) = \dfrac{4|x|}{x}$.



A) $\{-4, 4\}$
B) $[-4, 5]$
C) $(-5, 5)$
D) $(-\infty, 4]$
E) $(-4, 4)$
Ans: A

59. Evaluate (if possible) the function at the given value of the independent variable. Simplify the results.
$f(x) = -9x + 6,\ f(-1)$
A) 15
B) 3
C) 5
D) –7
E) undefined
Ans: A

60. If $C(x) = \left(x^2 - 1\right)/x$, find $C\left(\frac{1}{5}\right)$.

A) $-\frac{24}{25}$
B) $\frac{24}{5}$
C) –5
D) $-\frac{24}{5}$
E) –24
Ans: D

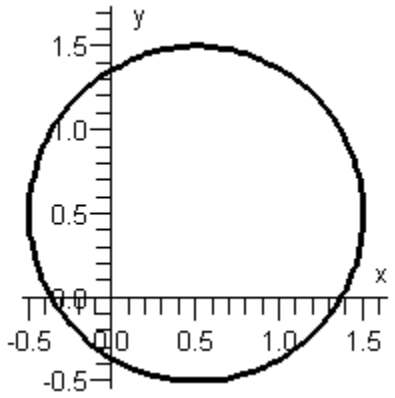
61. Simplify the expression using the given function definition.

$f(x) = -13x - 14, \ \frac{f(x) - f(-7)}{x + 7}$

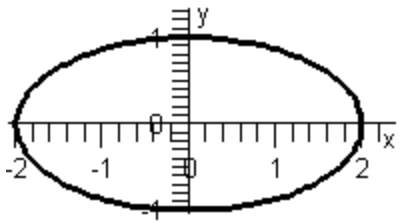
A) –8
B) –12
C) –13
D) –16
E) undefined
Ans: C

62. Use the Vertical Line Test to determine which of the following graphs shows *y* as a function of *x*.

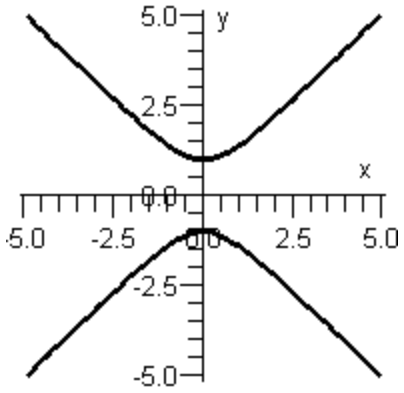
A)



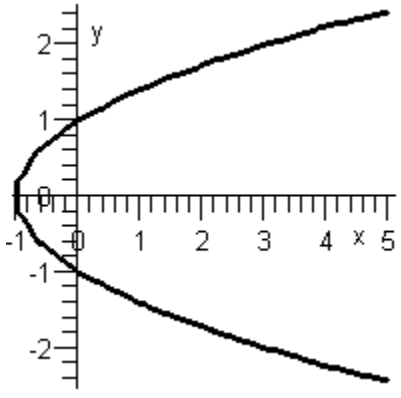
B)



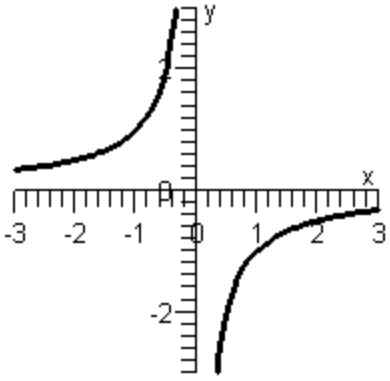
C)



D)



E)



Ans: E

63. Given $f(x) = \sqrt{x}$ and $g(x) = x^2 - 25$, find $f(g(x))$.

A) $f(g(x)) = \sqrt{x}(x^2 - 25)$

B) $f(g(x)) = \sqrt{x^2 - 25}$

C) $f(g(x)) = \sqrt{x - 5}$

D) $f(g(x)) = \sqrt{x - 25}$

E) $f(g(x)) = x - 25$

Ans: B

64. Given $f(x) = x^2 + 1$ and $g(x) = x - 9$, evaluate $f(g(3))$.

A) 1

B) 4

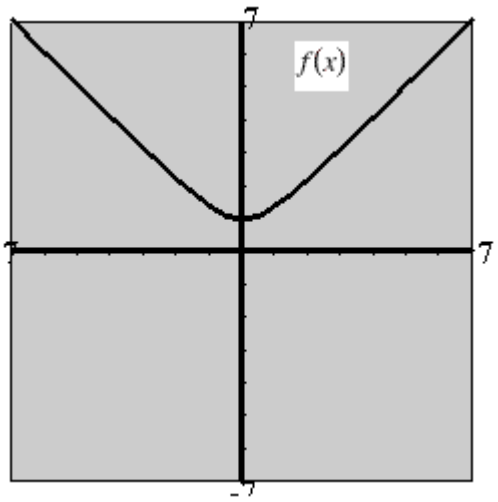
C) –60

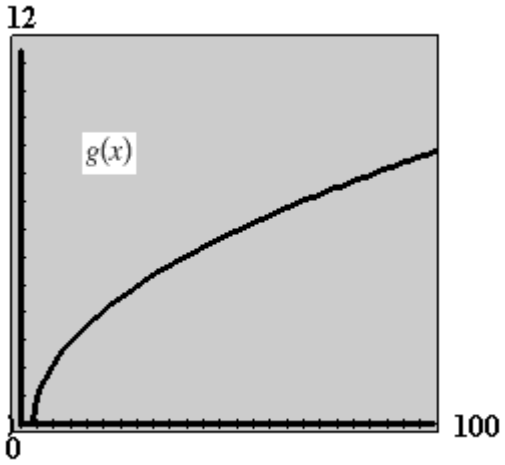
D) 37

E) 16

Ans: D

65. Use the Horizontal Line Test to determine whether the functions are one-to-one.

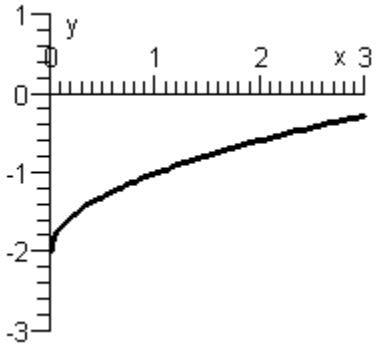




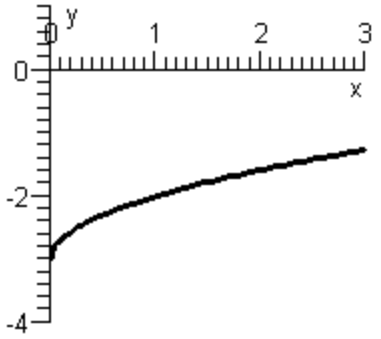
A) $f(x)$ and $g(x)$ both are one-to-one.
B) $f(x)$ is not one-to-one and $g(x)$ is one-to-one.
C) $f(x)$ and $g(x)$ both are not one-to-one.
D) $f(x)$ is one-to-one and $g(x)$ is not one-to-one.
Ans: B

66. Use the graph of $f(x) = \sqrt{x}$ to sketch $y = \sqrt{x} - 3$.

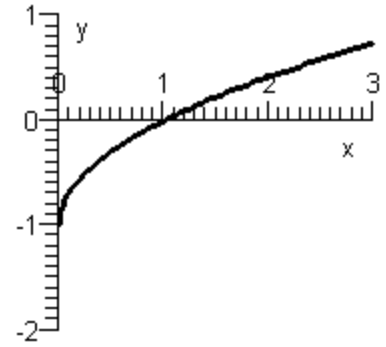
A)



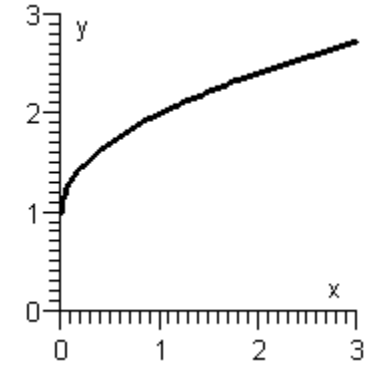
B)



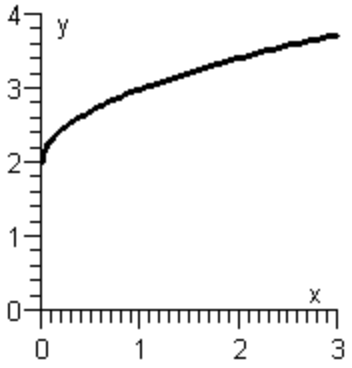
C)



D)

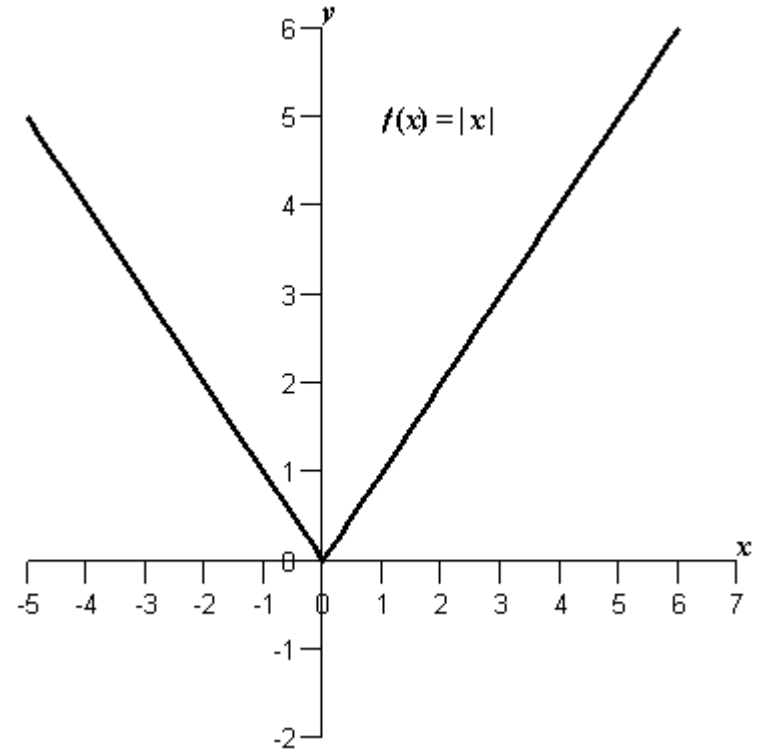


E)

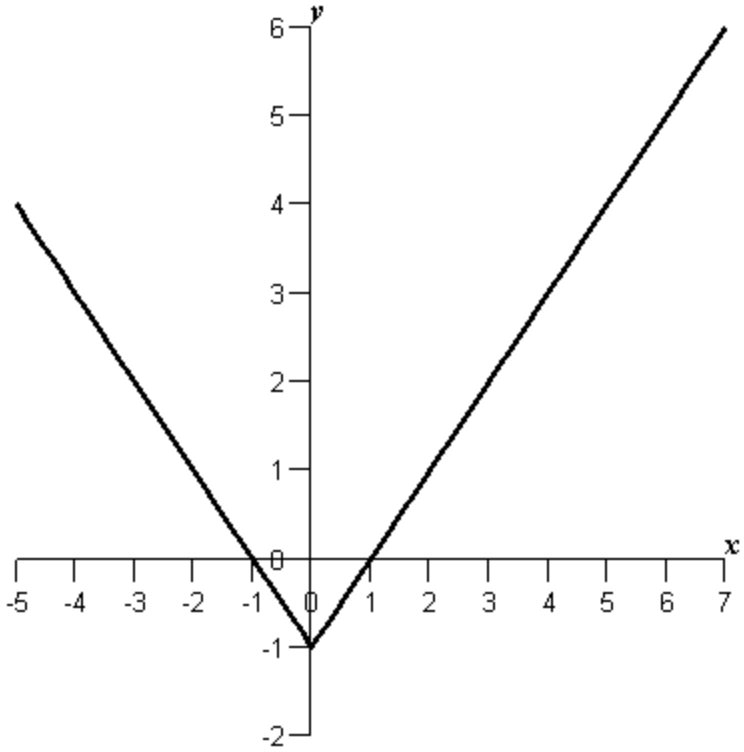


Ans: B

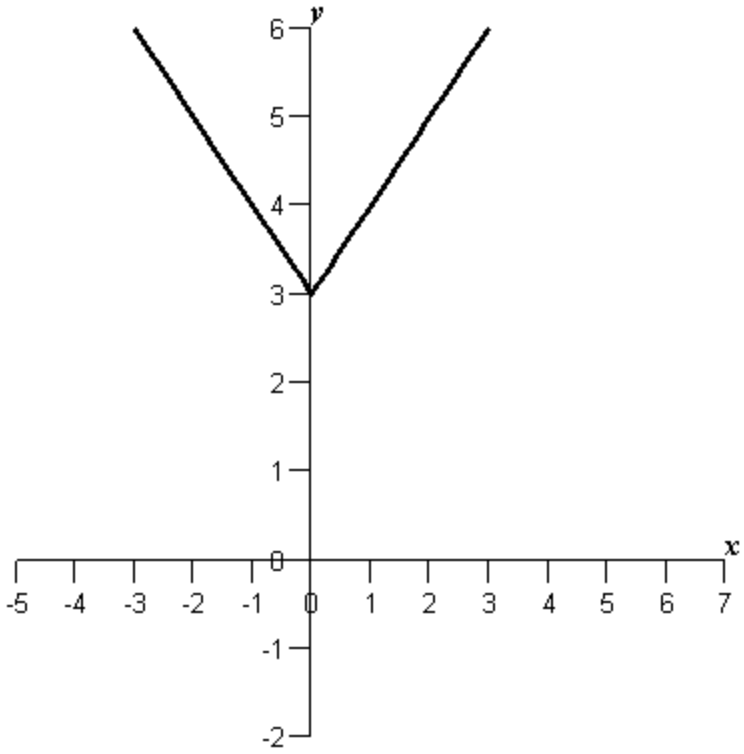
67. Use the graph of $f(x) = |x|$ below to sketch the graph of the following function: $|x| + 3$



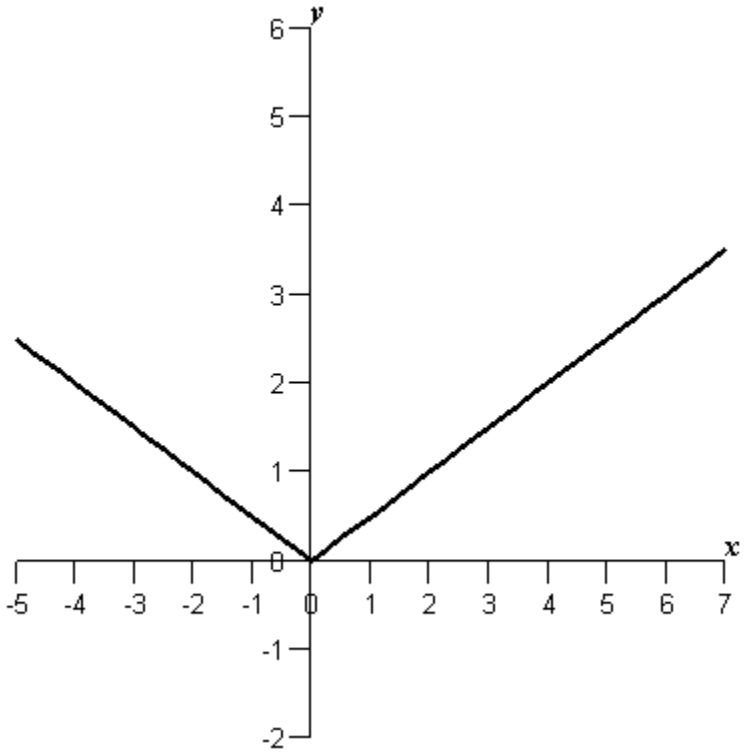
A)



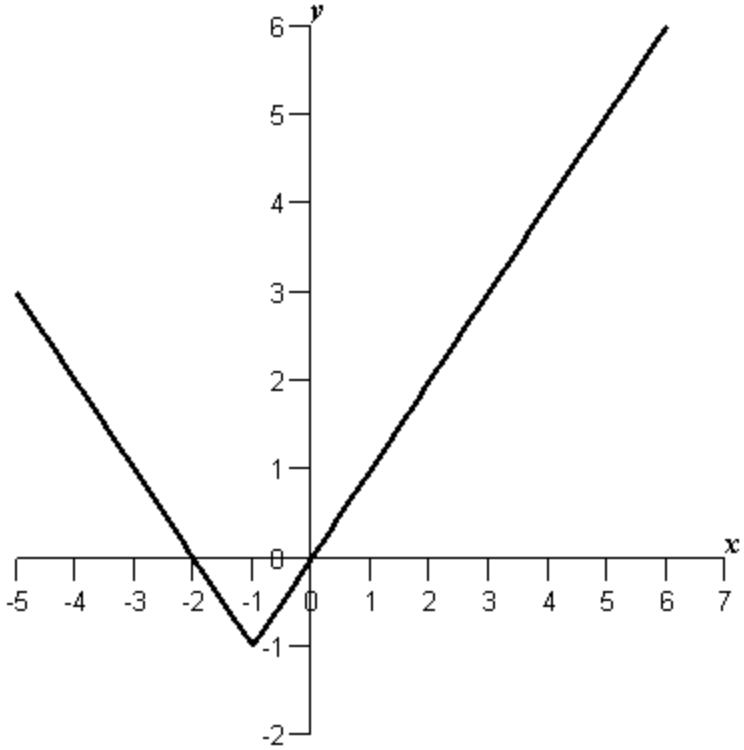
B)



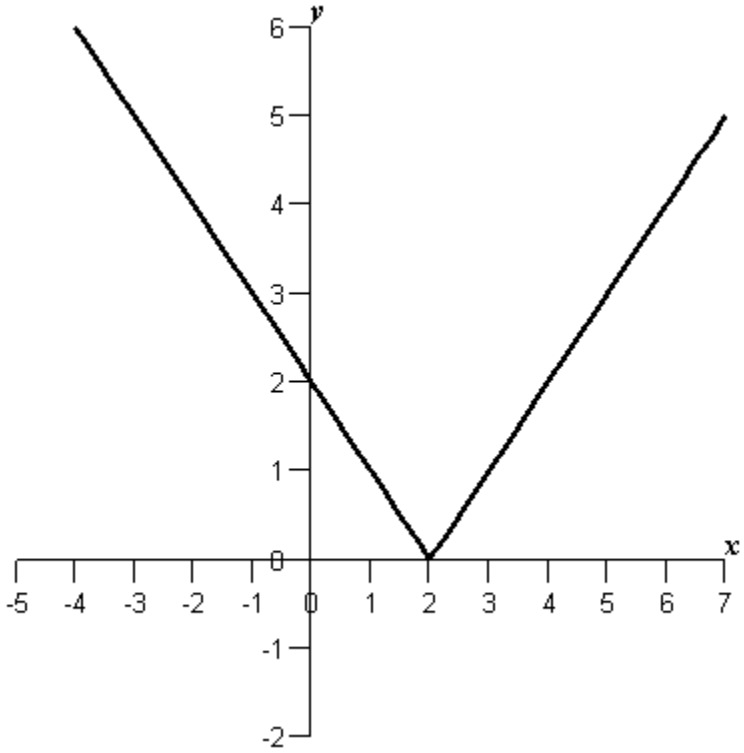
C)



D)



E)



Ans: B

68. The inventor of a new game believes that the variable cost for producing the game is \$0.97 per unit. The fixed cost is \$5000.

Find a formula for the average cost per unit $\overline{C} = C / x$.

A) $0.97x + 5000$

B) $0.97x - 5000$

C) $0.97 + \dfrac{5000}{x}$

D) $0.97x - \dfrac{5000}{x}$

E) $\dfrac{0.97}{x} - 5000$

Ans: C

69. A manufacturer charges \$70 per unit for units that cost \$60 to produce. To encourage large orders from distributors, the manufacturer will reduce the price by \$0.02 per unit for each unit in excess of 100 units. (For example, an order of 101 units would have a price of \$69.98 per unit, and an order of 102 units would have a price of \$69.96 per unit.) This price reduction is discontinued when the price per unit drops to \$64. Express the price per unit as a function of the order size.

A) $p = \begin{cases} 70 & 0 \le x \le 100 \\ 71 + 0.02x & 100 < x \le 400 \\ 64 & x > 400 \end{cases}$

B) $p = \begin{cases} 70 & 0 \le x \le 100 \\ 70 - 0.02(x - 100) & 100 \le x \le 400 \\ 64 & x > 400 \end{cases}$

C) $p = \begin{cases} 70 & 0 \le x \le 100 \\ 70 - 0.02(x - 100) & 100 < x \le 400 \\ 64 & x > 400 \end{cases}$

D) $p = \begin{cases} 70 & 0 \le x \le 100 \\ 70 + 0.02x & 100 < x \le 400 \\ 64 & x \ge 400 \end{cases}$

E) $p = \begin{cases} 70 & 0 \le x < 100 \\ 69 - 0.02x & 100 < x \le 400 \\ 64 & x \ge 400 \end{cases}$

Ans: C

70. Complete the table and use the result to estimate the limit.

$$\lim_{x\to 3}\frac{x-3}{x^2+x-12}$$

x	2.9	2.99	2.999	3.001	3.01	3.1
$f(x)$						

A) 0.142857
B) 0.642857
C) 0.517857
D) 0.767857
E) –0.232143
Ans: A

71. Complete the table and use the result to estimate the limit.

$$\lim_{x\to -2}\frac{\sqrt{-6x-10}-\sqrt{2}}{x+2}$$

x	–2.1	–2.01	–2.001	–1.999	–1.99	–1.9
$f(x)$						

A) 2.12132
B) –1.99632
C) –2.12132
D) 1.954654
E) 1.87132
Ans: C

72. Complete the table and use the result to estimate the limit.

$$\lim_{x\to -8}\frac{\frac{1}{x-3}+\frac{1}{11}}{x+8}$$

x	–8.1	–8.01	–8.001	–7.999	–7.99	–7.9
$f(x)$						

A) 0.121736
B) 0.101736
C) –0.138264
D) –0.008264
E) –0.118264
Ans: D

73. Suppose that $\lim_{x \to c} f(x) = 8$ and $\lim_{x \to c} g(x) = -11$. Find the following limit:

$\lim_{x \to c} \left[f(x) + g(x) \right]$

A) –88
B) 19
C) 0
D) –3
E) –11
Ans: D

74. Suppose that $\lim_{x \to c} f(x) = -12$ and $\lim_{x \to c} g(x) = -11$. Find the following limit:

$\lim_{x \to c} \left[f(x) g(x) \right]$

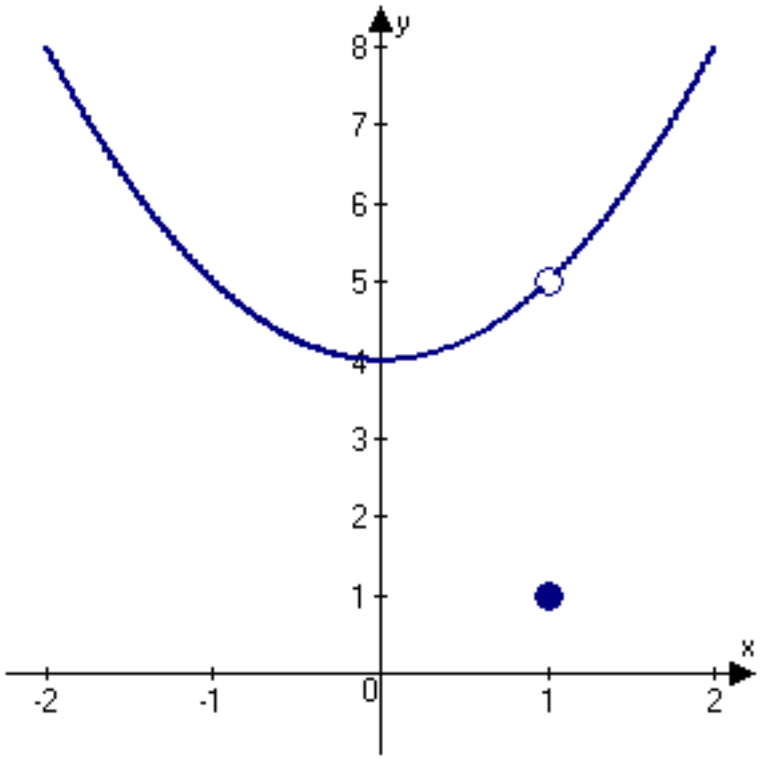
A) –12
B) –23
C) –1
D) 132
E) 11
Ans: D

75. Let

$$f(x)=\begin{cases} x^2+4, & x\neq 1 \\ 1, & x=1 \end{cases}.$$

Determine the following limit. (Hint: Use the graph of the function.)

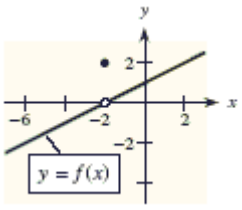
$$\lim_{x\to 1} f(x)$$



A) 5
B) 1
C) 4
D) 16
E) does not exist.
Ans: A

76. A graph of $y = f(x)$ is shown and a *c*-value is given. For this problem, use the graph to find $\lim_{x \to c} f(x)$.

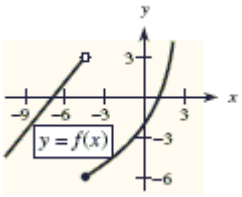
$c = -2$



A) 0
B) 2
C) –6
D) –4
E) does not exist
Ans: A

77. Use the graph of $y = f(x)$ and the given *c*-value to find $\lim_{x \to c^+} f(x)$.

$c = -4.5$



A) –6
B) –5
C) –7
D) 3
E) does not exist
Ans: A

78. Find the limit (if it exists):

$$\lim_{\Delta x \to 0} \frac{(x + \Delta x)^2 - 11(x + \Delta x) + 2 - (x^2 - 11x + 2)}{\Delta x}$$

A) $\frac{1}{3}x^3 - \frac{11}{2}x^2 + 2x$
B) $x^3 - 11x^2 + 2x$
C) 0
D) $2x - 11$
E) $x^2 - 11x + 2$
Ans: D

79. Find $\lim\limits_{x \to -4^-} \dfrac{1}{x+4}$.

A) 4
B) 0
C) $-\infty$
D) –4
E) inf
Ans: C

80. Find the limit: $\lim\limits_{x \to 13^+} \dfrac{x+7}{x-13}$.

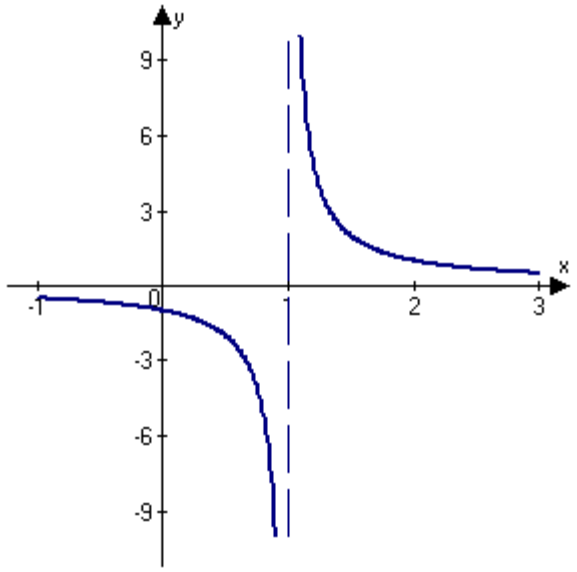
A) $-\infty$
B) ∞
C) 0
D) –1
E) 1
Ans: B

81. Find $\lim\limits_{x \to 3^+} \dfrac{-1}{(x-3)^2}$.

A) 3
B) inf
C) 0
D) –3
E) $-\infty$
Ans: E

82. Determine the following limit. (Hint: Use the graph of the function.)

$$\lim_{x \to 1} \frac{1}{x-1}$$



A) 0
B) does not exist
C) 1
D) –1
E) –2
Ans: B

83. Graph the function with a graphing utility and use it to predict the limit. Check your work either by using the table feature of the graphing utility or by finding the limit algebraically.

$$\lim_{x \to 3} \frac{x^3 - 2x^2 - 24x}{x^2 - 9x + 18}$$

A) $\frac{9}{7}$
B) 21
C) $\frac{7}{9}$
D) 0
E) does not exist
Ans: E

84. The cost (in dollars) of removing $p\%$ of the pollutants from the water in a small lake is given by $C = \dfrac{26{,}000p}{500 - p}, 0 \le p < 500$. Evaluate $\lim\limits_{p \to 500^-} C$.

A) ∞
B) $26{,}000$
C) 0
D) $-\infty$
E) $-26{,}000$
Ans: A

85. Consider a certificate of deposit that pays 14% (annual percentage rate) on an initial deposit of \$4000. The balance after 14 years is $A = 4000(1 + 0.14x)^{14/x}$. Estimate $\lim\limits_{x \to 0^+} A$, where x is the length of the compounding period (in years). Round your answer to the nearest hundredth.

A) 28,397.31
B) 1471.52
C) 4000.00
D) 56,000.00
E) 4560.00
Ans: A

86. Determine whether the given function is continuous. If it is not, identify where it is discontinuous.

$y = 5x^2 - 6x + 8$

A) discontinuous at $x = 9$
B) discontinuous at $x = 0$
C) discontinuous at $x = -9$
D) discontinuous at $x = 18$
E) continuous everywhere
Ans: E

87. Find the x-values (if any) at which the function $f(x) = -x^2 - 7x + 3$ is not continuous. Which of the discontinuities are removable?

A) continuous everywhere
B) $x = 3$, removable
C) $x = -\dfrac{7}{2}$, removable
D) $x = -\dfrac{7}{2}$, not removable
E) both B and C
Ans: A

88. Describe the interval(s) on which the function $f(x)=\dfrac{x-11}{x^2-121}$ is continuous.

A) $(-\infty,-11],(-11,11]\ \&\ (11,\infty)$
B) $(-\infty,11),(11,11)\ \&\ (11,\infty)$
C) $(-\infty,-11),(-11,11)\ \&\ (11,\infty)$
D) $(-\infty,-11],(-11,11)\ \&\ (11,\infty)$
E) $(-\infty,-11],\left[-11,11\right]\ \&\ \left[11,\infty\right)$

Ans: C

89. Determine whether the given function is continuous. If it is not, identify where it is discontinuous and which condition fails to hold. You can verify your conclusions by graphing the function with a graphing utility, if one is available.

$y=\dfrac{4x-7}{x^2+9}$

A) discontinuous at $x=-9$
B) discontinuous at $x=3$
C) discontinuous at $x=-3$
D) discontinuous at $x=9$
E) continuous everywhere

Ans: E

90. Find the x-values (if any) at which $f(x)$ is not continuous and identify whether they are removable or nonremovable.

$$f(x)=\begin{cases}-14x+15, & x<1\\ x^2, & x\geq 1\end{cases}$$

A) x = 1 is a removable discontinuity
B) x = 1 is a nonremovable discontinuity
C) x = -1 is a removable discontinuity
D) x = -1 is a nonremovable discontinuity
E) $f(x)$ has no discontinuities

Ans: E

91. Find the x-values (if any) at which the function $f(x)=\dfrac{x}{x^2+4}$ is not continuous. Which of the discontinuities are removable?

A) 2 and -2, not removable
B) continuous everywhere
C) 2 and -2, removable
D) discontinuous everywhere
E) none of the above

Ans: B

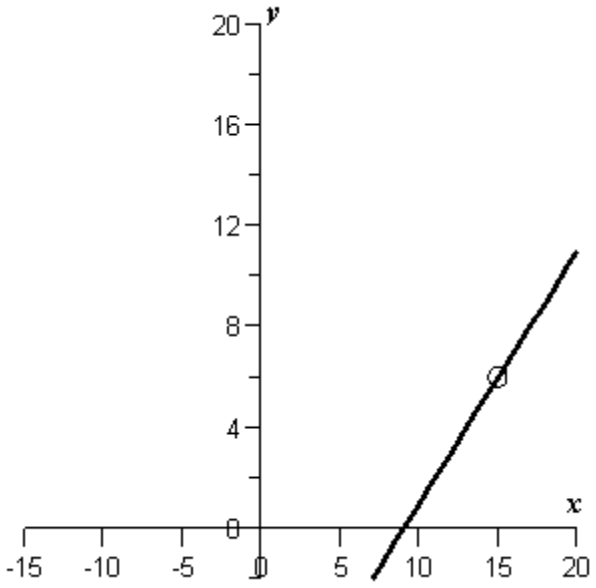
92. Find the x-values (if any) at which the function $f(x) = \dfrac{x-9}{x^2-6x-27}$ is not continuous. Which of the discontinuities are removable?

A) no points of discontinuity
B) $x = 9$ (not removable), $x = -3$ (removable)
C) $x = 9$ (removable), $x = -3$ (not removable)
D) no points of continuity
E) $x = 9$ (not removable), $x = -3$ (not removable)

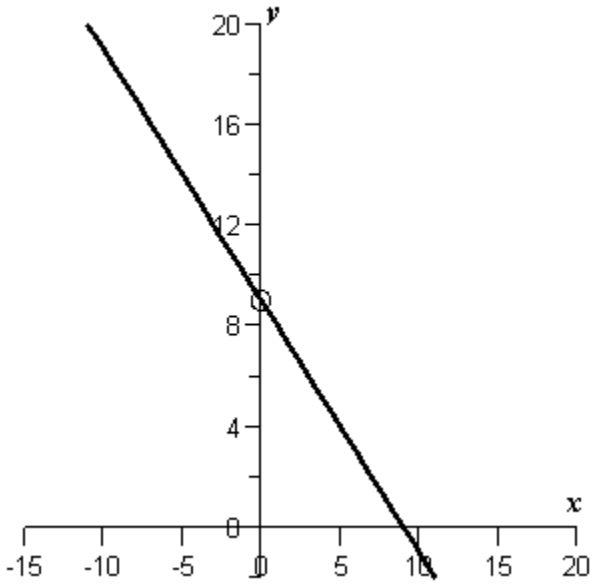
Ans: C

93. Sketch the graph of the function $f(x)=\dfrac{x^2-81}{x-9}$ and describe the interval(s) on which the function is continuous.

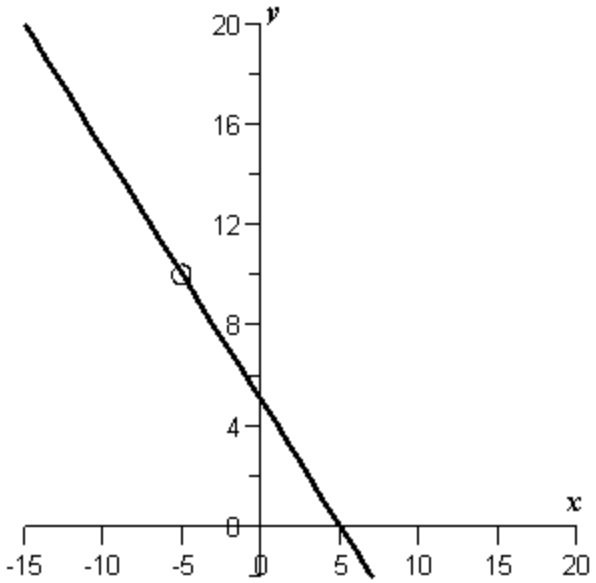
A) $(-\infty,9]$ and $[9,\infty)$



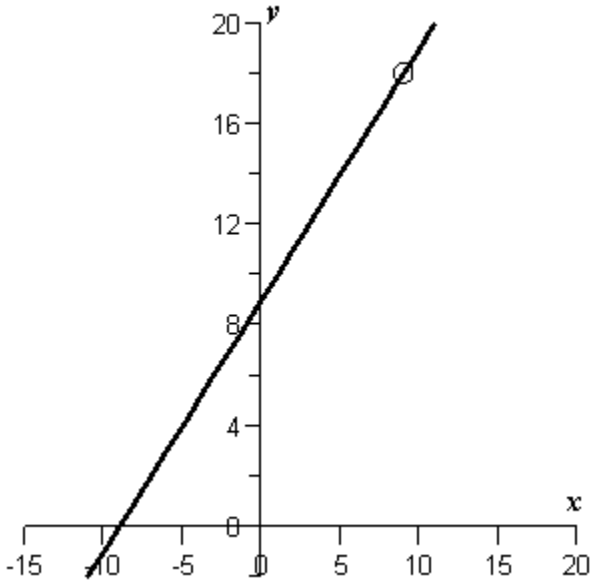
B) $(-\infty,-9]$ and $[9,\infty)$



C) $(-\infty,9]$ and $[-9,\infty)$



D) $(-\infty, 9)$ and $(9, \infty)$



E) none of these choices
Ans: D

94. Describe the interval(s) on which the function $f(x) = \begin{cases} x^2 - 16, & x \le 0 \\ 4x + 16, & x > 0 \end{cases}$ is continuous.

A) $(-\infty, 0]$ and $(0, \infty)$
B) $(-\infty, 0)$ and $[0, \infty)$
C) $(-\infty, 0)$ and $(0, \infty)$
D) $(-\infty, \infty)$
E) none of these choices
Ans: C

95. Find constants a and b such that the function

$$f(x)=\begin{cases}24, & x\le -9\\ ax+b, & -9<x<7\\ -24, & x\ge 7\end{cases}$$

is continuous on the entire real line.

A) $a = 3, b = 0$
B) $a = 3, b = -3$
C) $a = 3, b = 3$
D) $a = -3, b = 3$
E) $a = -3, b = -3$

Ans: E

96. A deposit of \$7500 is made in an account that pays 6% compounded every 5 months. The amount A in the account after t years is $A = 7500(1+0.025)^{\left[\frac{12}{5}t\right]}$, $t \ge 0$. What are the points of discontinuity of graph of $A = 7500(1+0.025)^{\left[\frac{12}{5}t\right]}$? (Here, the brackets indicate the greatest integer function.)

A) $0, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \ldots$
B) $0, 1, 2, \ldots$
C) $5, 10, 15, \ldots$
D) $1, 2, 3, \ldots$
E) $\frac{5}{12}, \frac{5}{6}, \frac{5}{4}, \ldots$

Ans: E

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