MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

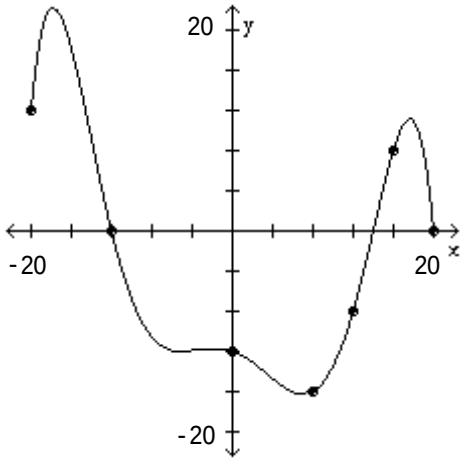
1) Given that $f(x) = \frac{x}{7 - x}$, find $f\left(-\frac{4}{5}\right)$. Express the answer as a simplified fraction.

A) $\frac{4}{39}$ B) $\frac{39}{4}$ C) $-\frac{39}{4}$ D) $-\frac{4}{39}$

Answer: D

The graph of a function f is given. Use the graph to answer the question.

2) Use the graph of f given below to find f(8).

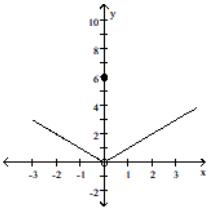


A) 8 B) 12 C) 0 D) -16

Answer: D

Use the graph to evaluate the indicated limit and function value or state that it does not exist.

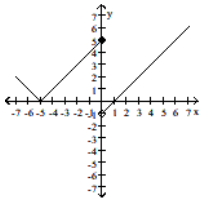
3) Find $\lim_{x \to 0} f(x)$ and f(0).



A) 6; 0 B) Does not exist; 6 C) 0; does not exist D) 0; 6

Answer: D

4) Find $\lim_{x \to 0^-} f(x)$ and $\lim_{x \to 0^+} f(x)$.



A) -1; 5
B) 5; -1
C) 5; Does not exist
D) Does not exist; does not exist

Answer: B

Find the limit, if it exists.

5) Find: $\lim_{x \to 1} \frac{6x + 5}{5x - 6}$

A) $\frac{1}{11}$
B) -11
C) 1
D) $-\frac{1}{11}$

Answer: A

6) Given $\lim_{x \to 4} f(x) = -2$ and $\lim_{x \to 4} g(x) = 5$, find $\lim_{x \to 4} \frac{[g(x) - f(x)]}{-4 f(x)}$.

A) $-\frac{7}{8}$
B) $\frac{3}{8}$
C) $-\frac{3}{8}$
D) $\frac{7}{8}$

Answer: D

7) Find: $\lim_{x \to 4} \frac{x^2 - 16}{x + 4}$

A) - 24
B) 8
C) -8
D) 16

Answer: C

8) Find: $\lim_{x \to 5} \frac{x - 5}{|x - 5|}$

A) 0
B) -1
C) 1
D) Does not exist

Answer: D

9) Find: $\lim_{x \to 3} \left(\frac{x^2 - 9}{x - 3} + \sqrt{x^2 + 7} \right)$

A) 3
B) 10
C) 2
D) Does not exist

Answer: B

10) Find: $\lim_{x \to 3} \frac{x - 3}{x^2 - 3x}$

A) $\frac{1}{3}$ B) $-\frac{1}{3}$ C) 0 D) Does not exist

Answer: D

11) Given $\lim_{x \to 5} f(x) = 4$ and $\lim_{x \to 5} g(x) = -5$, find $\lim_{x \to 5} \frac{2f(x) + 3g(x)}{3f(x)}$.

A) $-\frac{7}{15}$ B) $\frac{7}{15}$ C) $\frac{7}{12}$ D) $-\frac{7}{12}$

Answer: D

12) Evaluate the following limit

$\lim_{x \to 2^-} \frac{1}{x - 2}$

A) 2 B) $-\infty$ C) ∞ D) Does not exist

Answer: D

13) Let $f(x) = \frac{x^2 - 3x - 10}{x + 2}$. Find $\lim_{x \to 2} f(x)$.

A) 5 B) -7 C) -2 D) Does not exist

Answer: B

14) Let $f(x) = \begin{cases} \frac{x^2 - 16}{x + 4} \text{ if } x > 0 \\ \frac{x^2 - 16}{x - 4} \text{ if } x < 0 \end{cases}$

Find $\lim_{x \to 0^-} f(x)$.

A) ∞ B) 4 C) -4 D) Does not exist

Answer: B

15) Let $f(x) = \begin{cases} \frac{x^2 - 16}{x + 4} \text{ if } x > 0 \\ \frac{x^2 - 16}{x - 4} \text{ if } x < 0 \end{cases}$

Find $\lim_{x \to 0^+} f(x)$

A) -4 B) 0 C) 4 D) Does not exist

Answer: A

16) Let $f(x) = \begin{cases} \dfrac{x^2 - 16}{x + 4} & \text{if } x > 0 \\ \dfrac{x^2 - 16}{x - 4} & \text{if } x < 0 \end{cases}$

Find $\lim_{x \to 0} f(x)$.

A) $-\infty$ B) -4 C) 0 D) Does not exist

Answer: D

17) Evaluate the following limit.

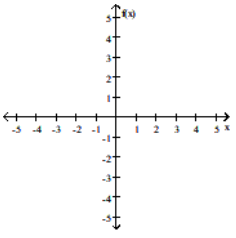
$$\lim_{x \to 2^+} \frac{1}{x - 2}$$

A) 2 B) ∞ C) $-\infty$ D) Does not exist

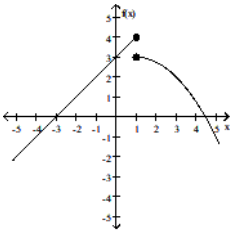
Answer: D

Sketch a possible graph of a function that satisfies the given conditions.

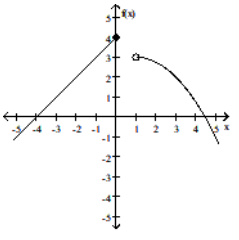
18) $f(1) = 4$; $\lim_{x \to 1^-} f(x) = 4$; $\lim_{x \to 1^+} f(x) = 3$



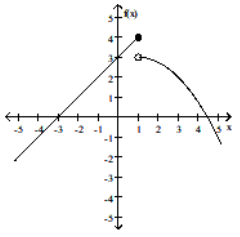
A)



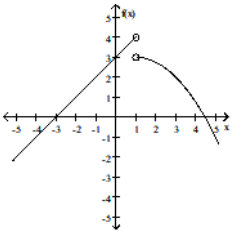
B)



C)

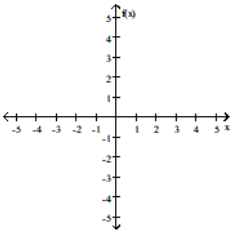


D)

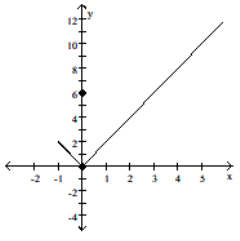


Answer: C

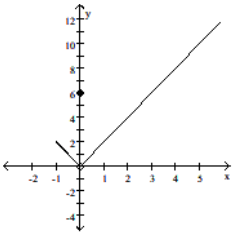
19) f(0) = 6; $\lim_{x \to 0^-} f(x) = 0$; $\lim_{x \to 0^+} f(x) = 0$



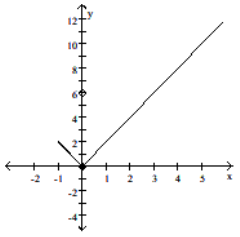
A)



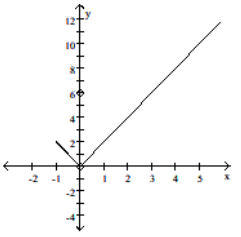
B)



C)



D)



Answer: B

Find the limit, if it exists.

20) Find: $\lim_{h \to 0} \frac{f(7 + h) - f(7)}{h}$ for $f(x) = -x + 1$.

A) 1 B) 0 C) -1 D) Does not exist

Answer: C

Solve the problem.

21) A company training program determines that, on average, a new employee can do P(x) pieces of work per day after s days of on-the-job training, where $P(x) = \frac{90 + 60x}{x + 5}$. Find $\lim_{x \to 5} P(x)$.

A) 42 B) 105 C) 30 D) Does not exist

Answer: C

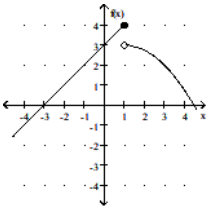
22) The cost of manufacturing a particular videotape is C(x) = 9000 + 9x, where x is the number of tapes produced. The average cost per tape, denoted by $\overline{C}(x)$, is found by dividing C(x) by x. Find $\lim_{x \to 9000} \overline{C}(x)$.

A) 14 B) 6 C) 10 D) Does not exist

Answer: C

Use the given graph to find the indicated limit.

23)

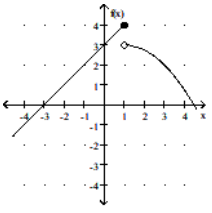


Find $\lim_{x \to \infty} f(x)$.

A) ∞ B) 3 C) 4 D) ∞

Answer: A

24)

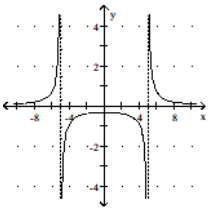


Find $\lim_{x \to \infty} f(x)$.

A) ∞ B) ∞ C) 4 D) 3

Answer: A

25)

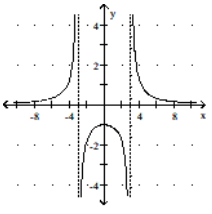


$\lim_{x \to 5^+} f(x)$

A) 0 B) ∞ C) $-\infty$ D) 5

Answer: B

26)



$\lim_{x \to 3^-} f(x)$

A) $-\infty$ B) 3 C) ∞ D) 0

Answer: A

Find the limit.

27) Determine the limit.

$\lim_{x \to -10^-} f(x)$, where $f(x) = \dfrac{1}{x + 10}$

A) 0 B) ∞ C) -1 D) $-\infty$

Answer: D

28) Determine the limit.

$\lim_{x \to 5^+} f(x)$, where $f(x) = \dfrac{x^2}{(x - 5)^3}$

A) $-\infty$ B) ∞ C) -2 D) 5

Answer: B

Provide an appropriate response.

29) If the limit at infinity exists, find the limit.

$$\lim_{x \to \infty} \frac{5x^2 + 7x - 9}{-6x^2 + 2}$$

A) $-\frac{2}{9}$ B) ∞ C) $-\frac{5}{6}$ D) 0

Answer: C

30) If the limit at infinity exists, find the limit.

$$\lim_{x \to \infty} \frac{3x^3 + 5x}{4x^4 + 10x^3 + 2}$$

A) ∞ B) 1 C) $\frac{3}{4}$ D) 0

Answer: D

Use $-\infty$ or ∞ where appropriate to describe the behavior at each zero of the denominator and identify all vertical asymptotes.

31) $g(x) = \frac{x}{6 - x}$

A) $\lim_{x \to 6^-} f(x) = -\infty$; $\lim_{x \to 6^+} f(x) = -\infty$; x = 6 is a vertical asymptote

B) $\lim_{x \to 6^-} f(x) = -\infty$; $\lim_{x \to 6^+} f(x) = \infty$; x = 6 is a vertical asymptote

C) $\lim_{x \to 6^-} f(x) = \infty$; $\lim_{x \to 6^+} f(x) = -\infty$; x = 0 is a vertical asymptote

D) $\lim_{x \to 6^-} f(x) = \infty$; $\lim_{x \to 6^+} f(x) = -\infty$; x = 6 is a vertical asymptote

Answer: D

32) $f(x) = \frac{x^2 - 16}{x^2 + 16}$

A) No zeros of denominator; no vertical asymptotes

B) $\lim_{x \to 4^-} f(x) = \infty$; $\lim_{x \to 4^+} f(x) = -\infty$; x = 4 is a vertical asymptote

C) $\lim_{x \to 4^-} f(x) = \infty$; $\lim_{x \to 4^+} f(x) = \infty$; x = 0 is a vertical asymptote

D) $\lim_{x \to -4^-} f(x) = \infty$; $\lim_{x \to -4^+} f(x) = -\infty$; x = -4 is a vertical asymptote

Answer: A

Describe the end behavior of the function.

33) $f(x) = 5x^4 + 5x + 11$

A) $\lim_{x \to \infty} f(x) = -\infty$; $\lim_{x \to -\infty} f(x) = -\infty$

B) $\lim_{x \to \infty} f(x) = -\infty$; $\lim_{x \to -\infty} f(x) = \infty$

C) $\lim_{x \to \infty} f(x) = \infty$; $\lim_{x \to -\infty} f(x) = -\infty$

D) $\lim_{x \to \infty} f(x) = \infty$; $\lim_{x \to -\infty} f(x) = \infty$

Answer: D

Provide an appropriate response.

34) Find the vertical asymptote(s) of the graph of the given function.

$f(x) = \frac{3x - 9}{5x + 30}$

A) $y = -3$ B) $x = -8$ C) $x = -6$ D) $y = 8$

Answer: C

35) Find the vertical asymptote(s) of the graph of the given function.

$f(x) = \frac{x^2 - 100}{(x - 9)(x + 3)}$

A) $x = 9, x = -3$ B) $x = -9$ C) $x = 10, x = -10$ D) $y = 9, y = -3$

Answer: A

36) Find the horizontal asymptote, if any, of the given function.

$f(x) = \frac{(x - 3)(x + 4)}{x^2 - 4}$

A) $y = 1$ B) $x = 2, x = -2$ C) $y = 3, y = -4$ D) None

Answer: A

37) Find the horizontal asymptote, if any, of the given function.

$f(x) = \frac{2x^3 - 3x - 9}{9x^3 - 5x + 3}$

A) $y = 0$ B) $y = \frac{2}{9}$ C) $y = \frac{3}{5}$ D) None

Answer: B

Solve the problem.

38) Suppose that the value V of a certain product decreases, or depreciates, with time t, in months, where

$V(t) = 23 - \frac{16t^2}{(t + 2)^2}$.

Find $\lim_{t \to \infty} V(t)$.

A) 16 B) 23 C) 7 D) 19

Answer: C

39) Suppose that the value V of a certain product decreases, or depreciates, with time t, in months, where

$V(t) = 100 - \frac{30t^2}{(t + 2)^2}$.

Find $\lim_{t \to \infty} V(t)$.

A) 100 B) 30 C) 70 D) 85

Answer: C

40) Suppose that the cost C of removing p% of the pollutants from a chemical dumping site is given by $C(p) = \frac{\$40{,}000}{100 - p}$.

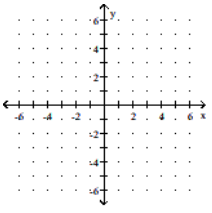
Can a company afford to remove 100% of the pollutants? Explain.

A) Yes, the cost of removing p% of the pollutants is $400, which is certainly affordable.
B) No, the cost of removing p% of the pollutants is $400, which is a prohibitive amount of money.
C) Yes, the cost of removing p% of the pollutants is $40,000, which is certainly affordable.
D) No, the cost of removing p% of the pollutants increases without bound as p approaches 100.

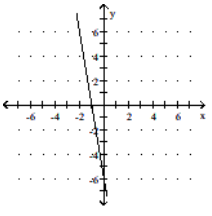
Answer: D

Sketch a possible graph of a function that satisfies the given conditions.

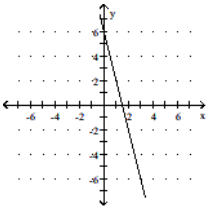
41) f(0) = and $\lim_{x \to 0} f(x) =$



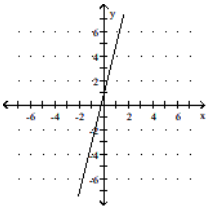
A)



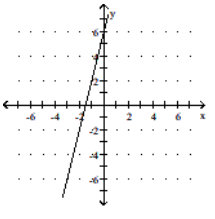
B)



C)

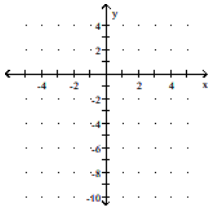


D)

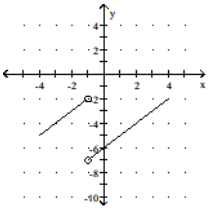


Answer: B

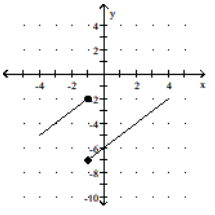
42) $f(-1) = -7$; $\lim_{x \to (-1)^-} f(x) = -2$; $\lim_{x \to (-1)^+} f(x) = -7$



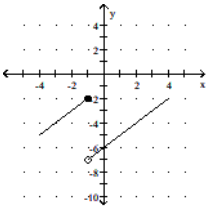
A)



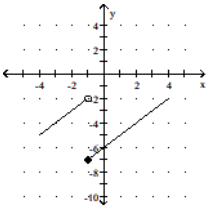
B)



C)



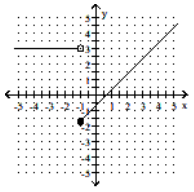
D)



Answer: D

The graph of y = f(x) is shown. Use the graph to answer the question.

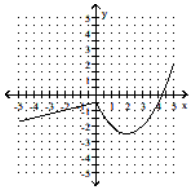
43) Is f continuous at x = -1?



A) Yes B) No

Answer: B

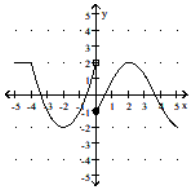
44) Is f continuous at x = 2?



A) Yes B) No

Answer: A

45) Is f continuous at x = -1?



A) No B) Yes

Answer: B

Provide an appropriate response.

46) Determine where the function $H(x) = \dfrac{x^2 + 7}{x^2 + x - 6}$ is continuous.

A) $(-\infty, -3) \cup (-3, 2)$
B) $(-\infty, -3) \cup (-3, 2) \cup (2, \infty)$
C) $(-\infty, -3)$
D) $(-3, 2) \cup (2, \infty)$

Answer: B

47) Determine where the function $f(x) = \dfrac{5x}{2x - 3}$ is continuous.

A) $(-\infty, \infty)$
B) $\left(-\infty, \dfrac{3}{2}\right)$
C) $\left(\dfrac{3}{2}, \infty\right)$
D) $\left(-\infty, \dfrac{3}{2}\right) \cup \left(\dfrac{3}{2}, \infty\right)$

Answer: D

48) Determine the x-values, if any, at which the function is discontinuous.

$$h(x) = \begin{cases} x^2 - 9 & \text{for } x < -1 \\ 0 & \text{for } -1 \le x \le 1 \\ x^2 + 9 & \text{for } x > 1 \end{cases}$$

A) 1
B) -1, 0, 1
C) -1, 1
D) None

Answer: C

49) Use a graphing utility to approximate the partition numbers of the function to four decimal places:
$f(x) = x^4 - 8x^2 - 4x + 1$.

A) $(-\infty, -2.4976) \cup (0.1832 , 3.0347)$
B) $(-\infty, -2.4976) \cup (-2.4976, -0.7203) \cup (-0.7203, 0.1832) \cup (0.1832 , 3.0347)$
C) $(-\infty, -2.4976)$
D) $(-\infty, -2.4976) \cup (-2.4976, -0.7203)$

Answer: B

50) Use a graphing utility to find the discontinuities of the given rational function.

$$g(x) = \frac{x + 1}{x^3 + 2x^2 + 10x - 13}$$

A) 3
B) 1
C) -1
D) Continuous at all values of x

Answer: B

51) Use a graphing utility to find the discontinuities of the given rational function.

$$g(x) = \frac{x + 1}{x^3 + 2x^2 + 10x - 13}$$

A) 1
B) 3
C) -1
D) Continuous at all values of x

Answer: A

52) Use a graphing utility to find the discontinuities of the given rational function.

$f(x) = \dfrac{x^2 + 2x + 1}{x^3 + 2x^2 + 5x - 8}$

A) 3 B) -1

C) 1 D) Continuous at all values of x

Answer: C

53) Solve the inequality and express the answer in interval notation: $\dfrac{x^2 - 4x}{x + 5} > 0$.

A) $(-5, 0) \cup (4, \infty)$ B) $(-5, \infty)$ C) $(-5, 0)$ D) $(4, \infty)$

Answer: A

54) Use a sign chart to solve the inequality. Express answers in interval notation.

$x^2 > 16$

A) $(4, \infty)$ B) $(-4, 4)$ C) $(-4, \infty)$ D) $(-\infty, -4) \cup (4, \infty)$

Answer: D

55) Use a sign chart to solve the inequality. Express answers in interval notation.

$x^2 + 6 < 2x$

A) {2} B) $(-\infty, -2)$ C) $\emptyset$ D) $(2, \infty)$

Answer: C

56) Use a sign chart to solve the inequality. Express answers in interval notation.

$\dfrac{-5}{-3x - 4} > 0$

A) $\left(-\infty, -\dfrac{3}{4}\right)$ B) $\left(-\infty, \dfrac{4}{3}\right)$ C) $\left(-\dfrac{4}{3}, \infty\right)$ D) $(0, \infty)$

Answer: C

Solve the problem.

57) The cost of renting a snowblower is $20 for the first hour (or any fraction thereof) and $5 for each additional hour (or fraction thereof) up to a maximum rental time of 5 hours. Write a piecewise definition of the cost C(x) of renting a snowblower for x hours. Is C(x) continuous at x = 2.5?

A) $C(x) = \begin{cases} 25 \text{ if } 0 < x \le 1 \\ 30 \text{ if } 1 < x \le 2 \\ 35 \text{ if } 2 < x \le 3 \\ 40 \text{ if } 3 < x \le 4 \\ 45 \text{ if } 4 < x \le 5 \end{cases}$; No

B) $C(x) = \begin{cases} 20 \text{ if } 0 \le x \le 1 \\ 25 \text{ if } 1 \le x \le 2 \\ 30 \text{ if } 2 \le x \le 3 \\ 35 \text{ if } 3 \le x \le 4 \\ 40 \text{ if } 4 \le x \le 5 \end{cases}$; No

C) $C(x) = \begin{cases} 20 \text{ if } 0 < x \le 1 \\ 25 \text{ if } 1 < x \le 2 \\ 30 \text{ if } 2 < x \le 3 \\ 35 \text{ if } 3 < x \le 4 \\ 40 \text{ if } 4 < x \le 5 \end{cases}$; Yes

D) $C(x) = \begin{cases} 20 \text{ if } 0 < x \le 1 \\ 25 \text{ if } 1 < x \le 2 \\ 30 \text{ if } 2 < x \le 3 \\ 35 \text{ if } 3 < x \le 4 \\ 40 \text{ if } 4 < x \le 5 \end{cases}$; No

Answer: C

Find average rate of change for the function over the given interval.

58) $y = x^2 + 6x$ between $x = 4$ and $x = 8$

A) 9 B) 18 C) 14 D) 28

Answer: B

59) $y = 5x^3 - 5x^2 - 7$ between $x = -9$ and $x = -4$

A) $-\frac{1825}{2}$ B) 730 C) $-\frac{407}{5}$ D) $\frac{407}{4}$

Answer: B

60) Find the average rate of change for $f(x) = \sqrt{2x}$ if x changes from 2 to 8.

A) 7 B) $-\frac{3}{10}$ C) $\frac{1}{3}$ D) 2

Answer: C

61) Find the average rate of change of y with respect to x if x changes from 3 to 5 in the function $y = x^2 + 3x$.

A) 22 B) 11 C) 4 D) 9

Answer: B

Find the instantaneous rate of change for the function at the value given.

62) Find the instantaneous rate of change for the function $x^2 + 7x$ at $x = 8$.

A) 120 B) 15 C) 23 D) 16

Answer: C

63) Find the instantaneous rate of change for the function $f(x) = 5x^2 + x$ at $x = -4$.

A) 6 B) -39 C) -14 D) -41

Answer: B

Provide an appropriate response.

64) Use the four step process to find f'(x) for the function $f(x) = 5x^2 - 3x$.

A) $10x + 5h - 3$ B) $5h^2 - 3h$ C) $5h - 3$ D) $10x - 3$

Answer: A

65) Use the four step process to find f'(x) for the function $f(x) = \frac{2}{x^2}$.

A) $\frac{2(h + x)}{x^2(x + h)^2}$ B) $-\frac{2(h + 2x)}{x^2(x + h)^2}$ C) $\frac{(h + 2x)}{x^2(x + h)^2}$ D) $-\frac{2(h + 2x + xh)}{x^2(x + h)^2}$

Answer: B

66) Use the four step process to find f'(x) for the function $f(x) = \frac{x}{6 - x}$.

A) $-\frac{x}{(x - 6)(x + h - 6)}$ B) $\frac{1}{(x - 6)(x + h - 6)}$

C) $-\frac{6}{h(x - 6)(x + h - 6)}$ D) $\frac{6}{(x - 6)(x + h - 6)}$

Answer: D

Use the definition $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ to find the derivative at x.

67) $f(x) = 13x - 12$

A) $13x$ B) 1 C) 13 D) -13

Answer: C

68) $f(x) = 6 - 6x^2$

A) $-12x^2$ B) $6 - 12x$ C) $-12x$ D) $6 - 6x$

Answer: C

69) $f(x) = 4x - 3x^3$

A) $4x - 9x^2$ B) $4 - 3x^2$ C) $4x - 9x^3$ D) $4 - 9x^2$

Answer: D

Provide an appropriate response.

70) Find the slope of the secant line joining (2, f(2)) and (3, f(3)) for $f(x) = -3x^2 - 8$.

A) 55 B) 15 C) -55 D) -15

Answer: D

71) Find the slope of the graph $f(x) = -x^2 + 3x$ at the point (1, 2).

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

Answer: D

72) Find the slope of the line tangent to the graph of the function at the given value of x.

$y = x^4 + 2x^3 + 2x + 2$ at $x = -3$

A) 65 B) -52 C) -50 D) 67

Answer: B

73) Given $f(x + h) - f(x) = 4xh + 4h + 2h^2$, find the slope of the tangent line at $x = 4$.

A) 20 B) 16 C) 8 D) 22

Answer: A

Find the equation of the tangent line to the curve when x has the given value.

74) $f(x) = -3 - x^2$; $x = 7$

A) $y = 14x - 46$ B) $y = -14x + 46$ C) $y = 7x + 46$ D) $y = -2x$

Answer: B

75) Find the equation of the tangent line to the graph of the function at the given value of x.

$f(x) = x^2 + 5x$ at $x = 4$

A) $y = -\frac{4}{25}x + \frac{8}{5}$ B) $y = \frac{1}{20}x + \frac{1}{5}$ C) $y = -39x - 80$ D) $y = 13x - 16$

Answer: D

Solve the problem.

76) Suppose an object moves along the y-axis so that its location is $y = f(x) = x^2 + x$ at time x (y is in meters and x is in seconds). Find the average velocity (the average rate of change of y with respect to x) for x changing from 2 to 9 seconds.

A) 12 m/s B) 3 m/s C) 15 m/s D) 84 m/s

Answer: A

77) Suppose an object moves along the y-axis so that its location is $y = f(x) = x^2 + x$ at time x (y is in meters and x is in seconds). Find the average velocity for x changing from 3 to 3 + h seconds.

A) 12 - h m/s B) 7 - h m/s C) 12 + h m/s D) 7 + h m/s

Answer: D

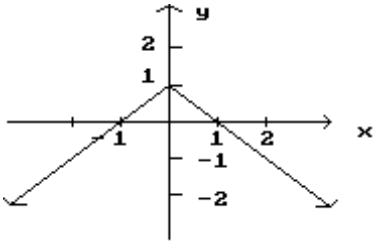
78) Suppose an object moves along the y-axis so that its location is $y = f(x) = x^2 + x$ at time x (y is in meters and x is in seconds). Find the instantaneous velocity at x = 4 seconds.

A) 9 m/s B) 10 m/s C) 8 m/s D) 20 m/s

Answer: A

List the x-values in the graph at which the function is not differentiable.

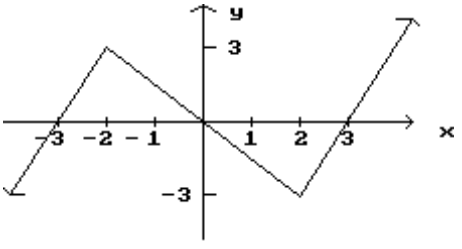
79)



A) x = 0 B) x = 1 C) x = -1 D) x = 2

Answer: A

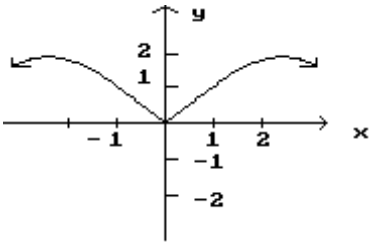
80)



A) x = -3, x = 0, x = 3 B) x = -2, x = 0, x = 2 C) x = -2, x = 2 D) x = -3, x = 3

Answer: C

81)



A) x = 2 B) x = 0 C) x = -2, x = 2 D) x = -2, x = 0, x = 2

Answer: B

Solve the problem.

82) If an object moves along a line so that it is at $y = f(x) = 3x^2 - 2x + 5$ at time x (in seconds), find the instantaneous velocity function v = f'(x).

A) 3x - 2 B) 6x - 2 C) $3x^2 - 2$ D) $6x^2 - 2$

Answer: B

83) If an object moves along a line so that it is at $y = f(x) = 8x^2$ at time x (in seconds), find the velocity at x = 1 (y is measured in feet).

A) 6 ft/sec B) 8 ft / s C) 16 ft / s D) 160 ft/s

Answer: C

84) The electric power p (in W) as a function of the current i (in A) in a certain circuit is given by $p(i) = 25i^2 + 70i$. Find the instantaneous rate of change of p with respect to i for i = 0.7 A.

A) 84 W/A B) 87.5 W/A C) 61.25 W/A D) 105 W/A

Answer: D

Provide an appropriate response.

85) Find f'(x) if $f(x) = \pi$.

A) $f'(x) = \pi^2$ B) $f'(x) = \pi$ C) f'(x) = 1 D) f'(x) = 0

Answer: D

86) Find y' if $y = \frac{5}{8}$.

A) $\frac{5}{8}x$ B) 1 C) 0 D) $\frac{5}{8}$

Answer: C

87) Find y' if y = 6x.

A) 0 B) x^2 C) 6 D) x

Answer: C

88) Find f'(x) for $f(x) = 2x^5 + 6x^8$.

A) $10x^4 + 48x^7$ B) $10x^6 + 48x^9$ C) $2x^4 + 6x^7$ D) $10x^3 + 48x^2$

Answer: A

89) Find the derivative of $y = \frac{3x^5 - 7x^2 - 4}{x^2}$.

A) $y' = 9x^2 + 8x^3$ B) $y' = 9x^2 + 8x^{-3}$ C) $y' = 9x^{-2} + 8x^{-3}$ D) $y' = 18x^2 + 8x^{-3}$

Answer: B

90) Let f and g be functions that satisfy f'(4) = 2 and g'(4) = -3. Find h'(4) for h(x) = 3f(x) - g(x) + 2.

A) 2 B) 9 C) 11 D) 5

Answer: B

91) Find f'(x) if $f(x) = 3x^4 + 6x^7$.

A) $12x^3 + 42x^6$ B) $4x^3 + 7x^6$ C) $7x^3 + 13x^6$ D) $3x^5 + 7x^8$

Answer: A

92) Find f'(x) if $f(x) = 6x^{-2} + 8x^3 + 11x$.

A) $f'(x) = -12x^{-3} + 24x^2 + 11$ B) $f(x) = -12x^{-1} + 24x^2$

C) $f'(x) = -12x^{-3} + 24x^2$ D) $f'(x) = -12x^{-1} + 24x^2 + 11$

Answer: A

93) Find f'(x) if $f(x) = 9x^{7/5} - 5x^2 + 10000$.

A) $f'(x) = \frac{63}{5}x^{2/5} - 10x$ B) $f'(x) = \frac{63}{5}x^{6/5} - 10x + 4000$

C) $f'(x) = \frac{63}{5}x^{2/5} - 10x + 4000$ D) $f'(x) = \frac{63}{5}x^{6/5} - 10x$

Answer: A

94) Find: $\frac{d}{dx}\left(\frac{4}{x^4} - 4\sqrt[5]{x}\right)$

A) $-\frac{16}{x^3} - \frac{4}{5}\sqrt[4]{x}$ B) $\frac{16}{x^3} - 20\sqrt[4]{x}$ C) $-\frac{16}{x^5} - \frac{4}{5\sqrt[5]{x^4}}$ D) $\frac{1}{x^3} - \frac{4}{5}\sqrt[4]{x}$

Answer: C

95) Find: $\frac{dy}{dt}$ if $y = 3t^{-4} - 5t^{-1}$

A) $-12t^{-5} + 5t^{-2}$ B) $-12t^5 - 5t^2$ C) $-\frac{12}{t^5} - \frac{5}{t^2}$ D) $-12t^{-5} - 5t^{-2}$

Answer: A

96) Find: $\frac{d}{dx}\left(\frac{4}{x^4} - 5\sqrt[3]{x}\right)$

A) $-16x^{-5} - \frac{5}{3}x^{-2/3}$ B) $\frac{1}{4x^3} - \frac{5}{3}x^{-2/3}$ C) $\frac{1}{x^3} + \frac{5}{3}x^{-4/3}$ D) $\frac{1}{4}x^{-5} - 15x^{2/3}$

Answer: A

97) Find $\frac{d}{dv}(6v^{0.7} - v^{5.8})$

A) $4.2v^{-0.3} - 5.8v^{-4.7}$ B) $4.2v^{-0.3} - 5.8v^{4.7}$ C) $4.2v^{-0.3} - 5.8v^{-4.8}$ D) $4.2v^{-0.3} - 5.8v^{4.8}$

Answer: D

98) Find $\frac{dy}{dx}$ for $y = \frac{1}{3x^3} + \frac{x^7}{10}$.

A) $-x^{-4} + \frac{7}{10}x^6$ B) $\frac{1}{9x^2} + \frac{7x^6}{10}$ C) $-x^{-2} + \frac{7}{10}x^7$ D) $\frac{7x^6}{9x^2 + 10}$

Answer: A

99) Find the equation of the tangent line at x = 7 for $f(x) = 6 - x^2$. Write the answer in the form y = mx + b.

A) y = 14x - 55 B) y = 7x + 55 C) y = - 2x D) y = - 14x + 55

Answer: D

100) Find the equation of the tangent line at x = - 6 for $f(x) = \frac{x^3}{2}$. Write the answer in the form y = mx + b.

A) y = 54x + 216 B) y = 216x + 54 C) y = 216x + 18 D) y = 18x + 216

Answer: A

101) Find the values of x where the tangent line is horizontal for $f(x) = 3x^3 - 2x^2 - 9$.

A) $x = 0, x = -\frac{2}{3}$ B) $x = 0, x = \frac{2}{3}$ C) $x = 0, x = \frac{4}{9}$ D) $x = 0, x = -\frac{4}{9}$

Answer: C

102) Find the equation of the tangent line at x = 2 for $f(x) = 4 + x - 2x^2 - 3x^3$. Write the answer in the form y = mx + b.

A) y = -47x + 68 B) y = -43x + 48 C) y = -43x + 60 D) y = -39x + 52

Answer: C

Solve the problem.

103) An object moves along the y-axis (marked in feet) so that its position at time t (in seconds) is given by $f(t) = 9t^3 - 9t^2 + t + 7$. Find the velocity at three seconds.

A) 190 feet per second B) 109 feet per second C) 192 feet per second D) 197 feet per second

Answer: A

104) A pen manufacturer determined that the total cost in dollars of producing x dozen pens in one day is given by:

$C(x) = 350 + 2x - 0.01x^2, \quad 0 \le x \le 100$

Find the marginal cost at a production level of 70 dozen pens and interpret the result.

A) The marginal cost is \$0.59/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.59.

B) The marginal cost is \$0.60/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.60.

C) The marginal cost is \$0.58/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.58.

D) The marginal cost is \$0.62/doz. The cost of producing 1 dozen more pens at a production level of 70 dozen pens is approximately \$0.62.

Answer: B

105) According to one theory of learning, the number of items, w(t), that a person can learn after t hours of instructior given by:

$w(t) = 15\sqrt[3]{t^2}, \quad 0 \le t \le 64$

Find the rate of learning at the end of eight hours of instruction.

A) 20 items per hour B) 45 items per hour C) 5 items per hour D) 60 items per hour

Answer: C

Find $\triangle y$ for the given values of x_1 and x_2.

106) $y = 2x + 3;\ x = 18, \triangle x = 0.5$

A) 1 B) 0.5 C) 0.1 D) 5

Answer: A

Find dy.

107) $y = 7x^2 + 3x + 3$

A) $14x + 6\ dx$ B) $14x\ dx$ C) $14x + 3\ dx$ D) $(14x + 3)\ dx$

Answer: D

108) $y = x\sqrt{5x + 4}$

A) $\frac{15x - 8}{\sqrt{5x + 4}}\ dx$ B) $\frac{15x + 8}{2\sqrt{5x + 4}}\ dx$ C) $\frac{15x - 8}{2\sqrt{5x + 4}}\ dx$ D) $\frac{15x + 8}{\sqrt{5x + 4}}\ dx$

Answer: B

Provide an appropriate response.

109) Evaluate dy and $\triangle y$ for $y = f(x) = x^2 - 7x + 5$, $x = 7$, and $dx = \triangle x = 0.5$.

A) $dy = 3.75; \triangle y = 3.5$ B) $dy = 3.75; \triangle y = 3.75$ C) $dy = 3.5; \triangle y = 3.5$ D) $dy = 3.5; \triangle y = 3.75$

Answer: D

110) Evaluate dy and $\triangle y$ for $y = f(x) = 20 + 15x^2 - x^3$, $x = 2$, and $dx = \triangle x = 0.3$.

A) $dy = 15.183; \triangle y = 14.4$ B) $dy = 15.183; \triangle y = 15.183$

C) $dy = 14.4; \triangle y = 14.4$ D) $dy = 14.4; \triangle y = 15.183$

Answer: D

111) A spherical balloon is being inflated. Find the approximate change in volume if the radius increases from 6.1 cm to 6.3 cm. (Recall that $V = \frac{4}{3}\pi r^3$.)

A) 302.64 cm^3 B) 0.976π cm^3 C) 148.84π cm^3 D) 29.768π cm^3

Answer: D

Solve the problem.

112) A cube 4 inches on an edge is given a protective coating 0.2 inches thick. About how much coating should a production manager order for 800 cubes?

A) About 10,240 $in.^3$ B) About 7,680 $in.^2$ C) About 2,560 $in.^2$ D) About 15,360 $in.^3$

Answer: D

113) One hour after x milligrams of a particular drug are given to a person, the change in body temperature T (in degrees Fahrenheit) is given by $T = x^2\left(1 - \frac{x}{8}\right)$, where $0 \le x \le 3$. Approximate the changes in body temperature produced by changing the drug dosage from 1 to 1.8 milligrams. Round to the nearest hundredth when necessary.

A) 1.63°F B) 2.93°F C) 0.25°F D) 1.3°F

Answer: D

114) $V = \frac{4}{3}\pi r^3$, where r is the radius, in centimeters. By approximately how much does the volume of a sphere increase when the radius is increased from 1.0 cm to 1.1 cm? (Use 3.14 for π.)

A) 1.3 cm^3 B) 1.5 cm^3 C) 0.1 cm^3 D) 1.1 cm^3

Answer: A

Provide an appropriate response.

115) Suppose that the total profit in hundreds of dollars from selling x items is given by $P(x) = 4x^2 - 5x + 10$. Find the marginal profit at x = 5.

A) $45 B) $15 C) $35 D) $32

Answer: C

116) The revenue (in thousands of dollars) from producing x units of an item is modeled by $R(x) = 5x - 0.0005x^2$. Find the marginal revenue at x = 1000.

A) $4.50 B) $104.00 C) $4.00 D) $10,300.00

Answer: C

117) Let C(x) be the cost function and R(x) the revenue function. Compute the marginal cost, marginal revenue, and th marginal profit functions.

$C(x) = 0.0005x^3 - 0.012x^2 + 100x + 30{,}000$

$R(x) = 450x$

A) $C'(x) = 0.0015x^2 - 0.024x + 100$
$R'(x) = 450$
$P'(x) = 0.0015x^2 - 0.024x - 350$

B) $C'(x) = 0.0015x^2 + 0.024x + 100$
$R'(x) = 450$
$P'(x) = 0.0015x^2 + 0.024x + 350$

C) $C'(x) = 0.0015x^2 - 0.024x + 100$
$R'(x) = 450$
$P'(x) = -0.0015x^2 + 0.024x + 350$

Answer: C

118) The total cost to produce x units of paint is $C(x) = (5x + 3)(7x + 4)$. Find the marginal average cost function.

A) $\overline{C}'(x) = 35 - \frac{12}{x^2}$

B) $\overline{C}'(x) = 70x + 41$

C) $\overline{C}'(x) = 35x + 41 + \frac{12}{x}$

D) $\overline{C}'(x) = 70 - \frac{41}{x}$

Answer: A

119) The total profit from selling x units of doorknobs is $P(x) = (6x - 7)(9x - 8)$. Find the marginal average profit function.

A) $\overline{P}'(x) = 54x - 56$

B) $\overline{P}'(x) = 54 - \frac{111}{x^2}$

C) $\overline{P}'(x) = 54x - 111$

D) $\overline{P}'(x) = 54 - \frac{56}{x^2}$

Answer: D

120) The total cost in dollars of producing x lawn mowers is given by $C(x) = 4{,}000 + 90x - \frac{x^2}{3}$. Find the marginal average cost at $x = 20$, $\overline{C}'(20)$ and interpret the result.

A) -$13.33; a unit increase in production will decrease the average cost per unit by approximately $13.33 at a production level of 20 units.

B) -$1.33; a unit increase in production will decrease the average cost per unit by approximately $1.33 at a production level of 20 units.

C) -$10.33; a unit increase in production will decrease the average cost per unit by approximately $10.33 at a production level of 20 units.

D) -$20.33; a unit increase in production will decrease the average cost per unit by approximately $20.33 at a production level of 20 units.

Answer: C

Solve the problem.

121) The demand equation for a certain item is $p = 14 - \frac{x}{1{,}000}$ and the cost equation is $C(x) = 7{,}000 + 4x$. Find the marginal profit at a production level of 3,000 and interpret the result.

A) $7; at the 3,000 level of production, profit will increase by approximately $7 for each unit increase in production.

B) $16; at the 3,000 level of production, profit will increase by approximately $16 for each unit increase in production.

C) $14; at the 3,000 level of production, profit will increase by approximately $14 for each unit increase in production.

D) $4; at the 3,000 level of production, profit will increase by approximately $4 for each unit increase in production.

Answer: D

122) A company is planning to manufacture a new blender. After conducting extensive market surveys, the research department estimates a weekly demand of 600 blenders at a price of $50 per blender and a weekly demand of 800 blenders at a price of $40 per blender. Assuming the demand equation is linear, use the research department's estimates to find the revenue equation in terms of the demand x.

A) $R(x) = 80x - 20$ B) $R(x) = 20x + \frac{x^2}{20}$ C) $R(x) = 80x - \frac{x^2}{20}$ D) $R(x) = 80x - 20x^2$

Answer: C

123) Suppose the demand for a certain item is given by $D(p) = -3p^2 + 3p + 4$, where p represents the price of the item. Find D'(p), the rate of change of demand with respect to price.

A) $D'(p) = -3p^2 + 3$ B) $D'(p) = -6p^2 + 3$ C) $D'(p) = -3p + 3$ D) $D'(p) = -6p + 3$

Answer: D