MATH 150/GRACEY Name________________________________

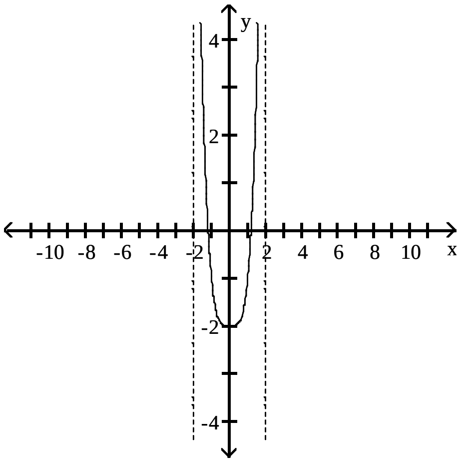
PRACTICE FINAL

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

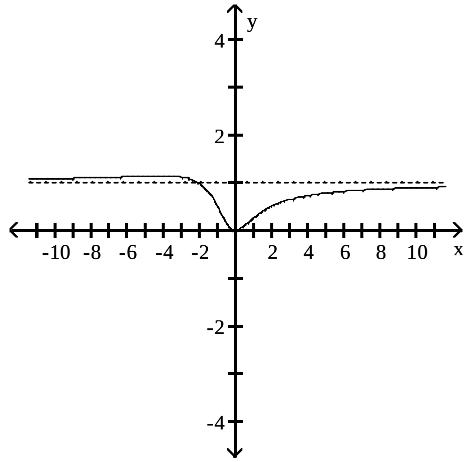
Choose the graph that represents the given function without using a graphing utility.

1) $f(x) = \dfrac{x}{x^2 + x + 2}$ 1) _______

A)



B)



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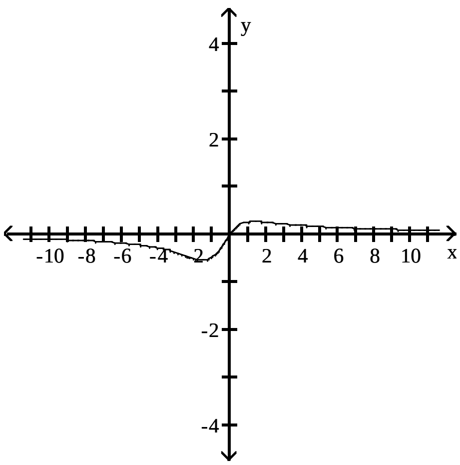
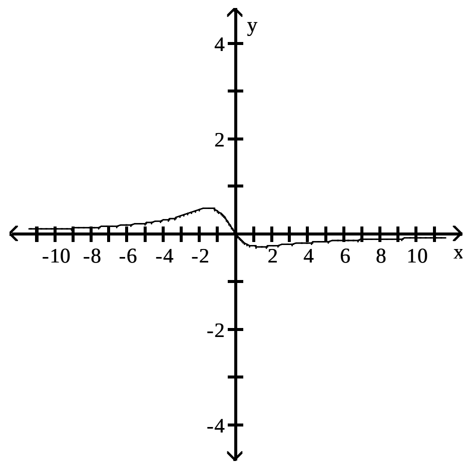
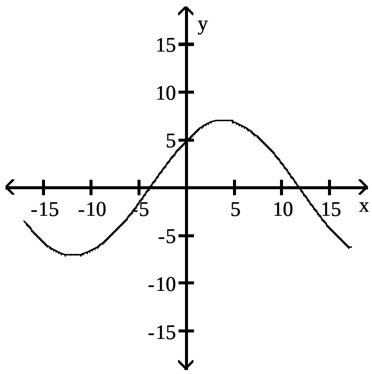


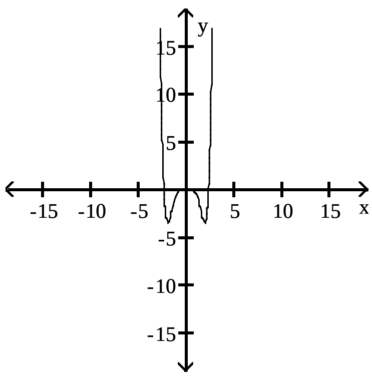
D)

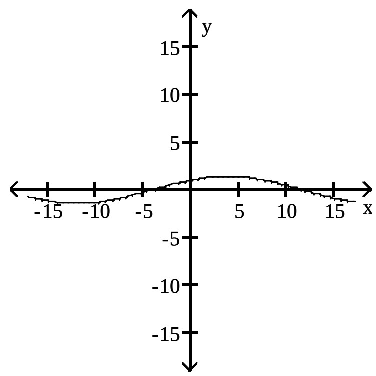


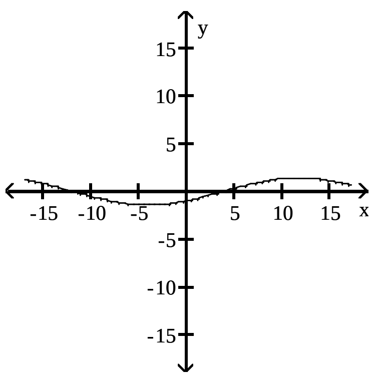
The graph of a function is given. Choose the answer that represents the graph of its derivative.

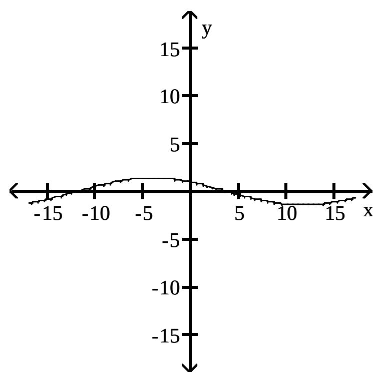
2) 

2) ________

A) 

B) 

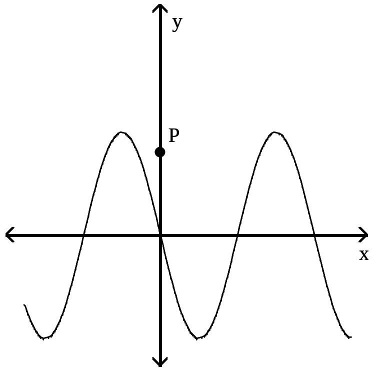
C) 

D) 

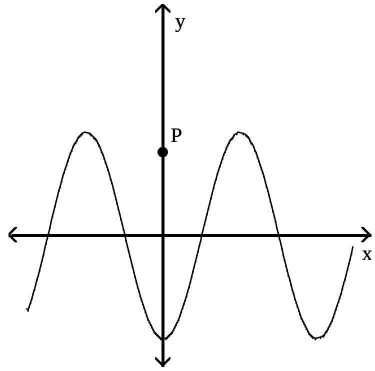
Solve the problem.

3) The graphs below show the first and second derivatives of a function y = f(x). Select a possible graph f that passes through the point P. 3) ________

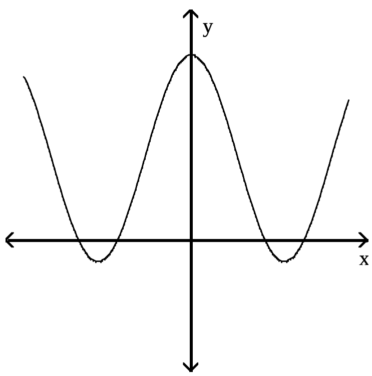
f′



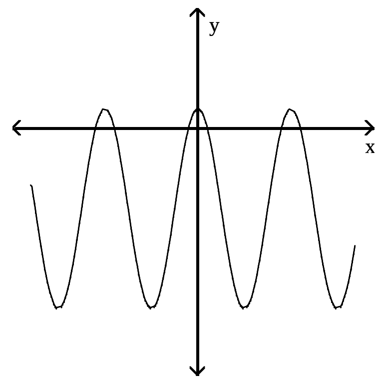
f″



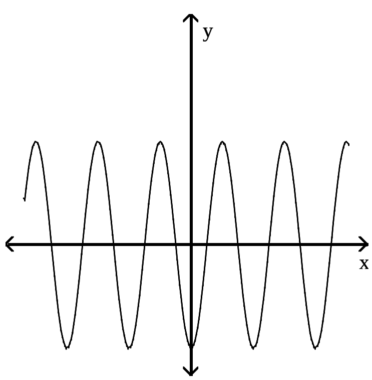
A)



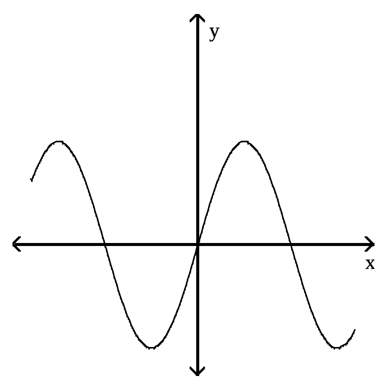
B)



C)

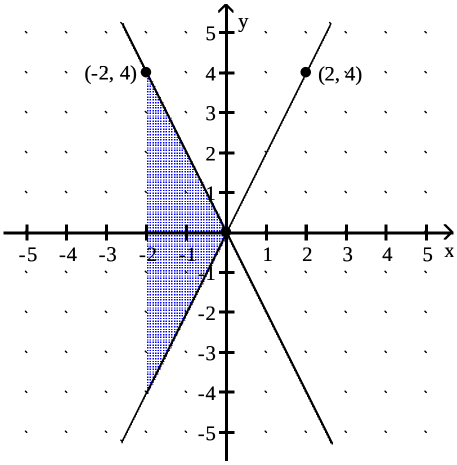


D)



Provide an appropriate response.

4) Which of the following integrals, if any, calculates the area of the shaded region? 4) ________

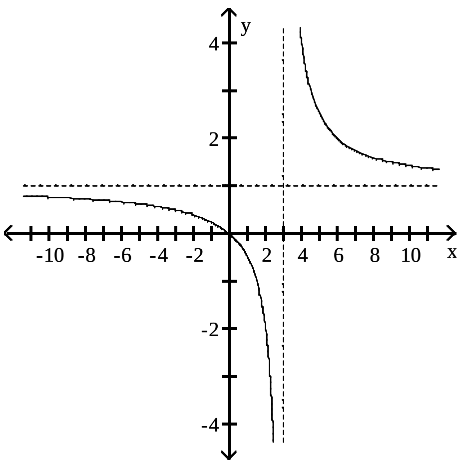


A) $\int_{-2}^{0} 4x\,dx$ B) $\int_{-4}^{4} -4x\,dx$ C) $\int_{-2}^{2} 4x\,dx$ D) $\int_{-2}^{0} -4x\,dx$

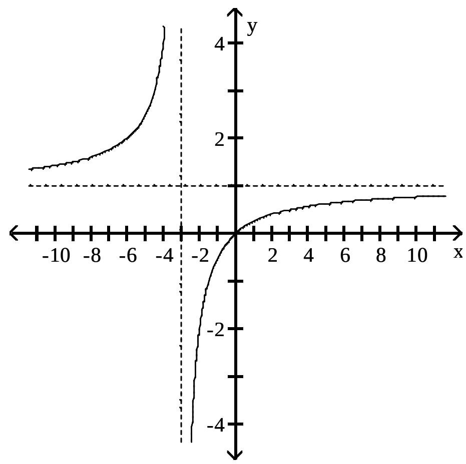
Choose the graph that represents the given function without using a graphing utility.

5) $f(x) = \dfrac{x}{x + 3}$ 5) ________

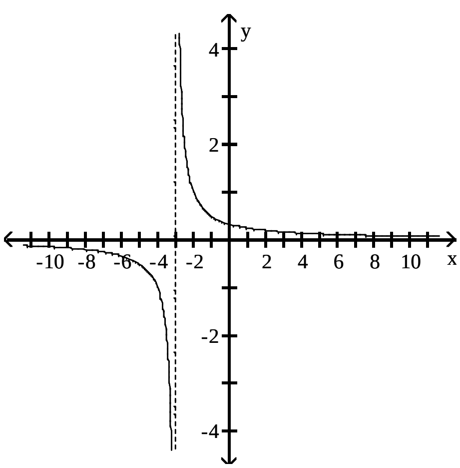
A)



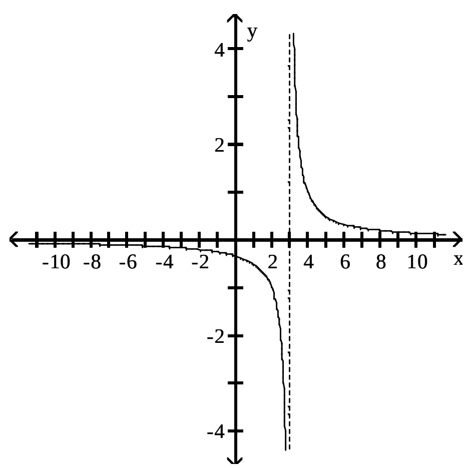
B)



C)

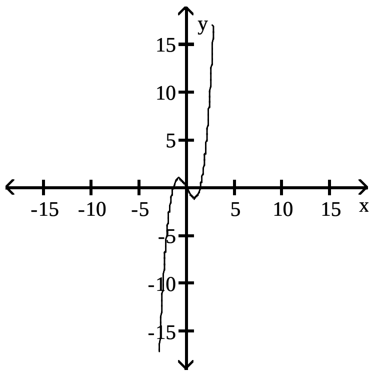


D)



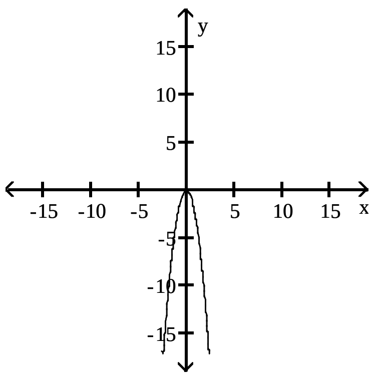
The graph of a function is given. Choose the answer that represents the graph of its derivative.

6)

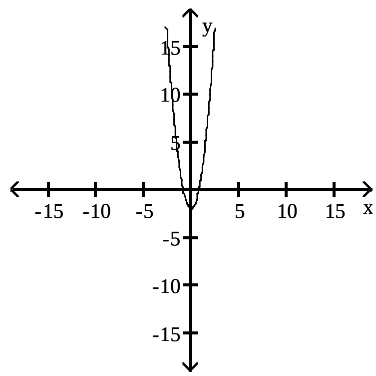


6) ________

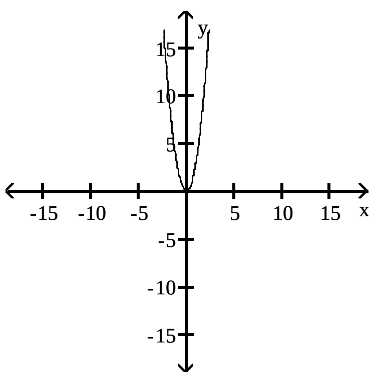
A)



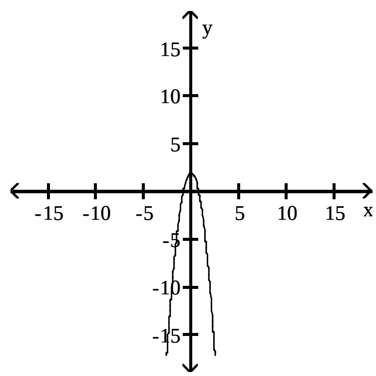
B)



C)

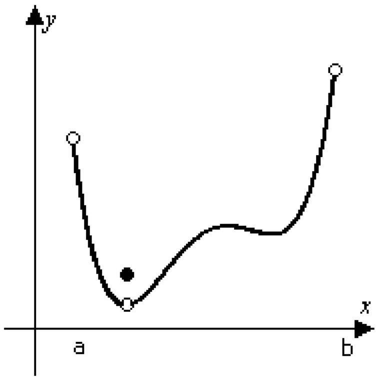


D)



Determine from the graph whether the function has any absolute extreme values on the interval [a, b].

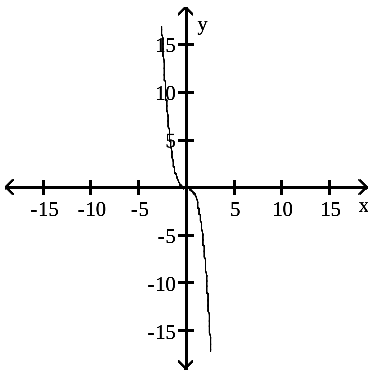
7) 7) ________



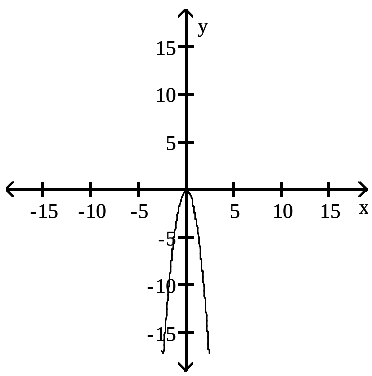
A) Absolute minimum only.
B) Absolute maximum only.
C) No absolute extrema.
D) Absolute minimum and absolute maximum.

The graph of a function is given. Choose the answer that represents the graph of its derivative.

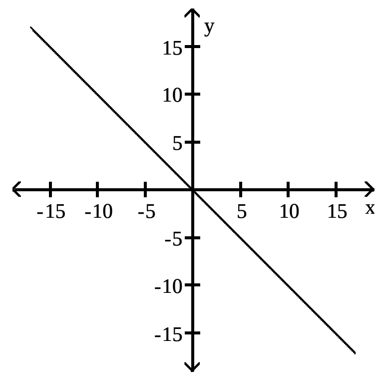
8) 8) ________



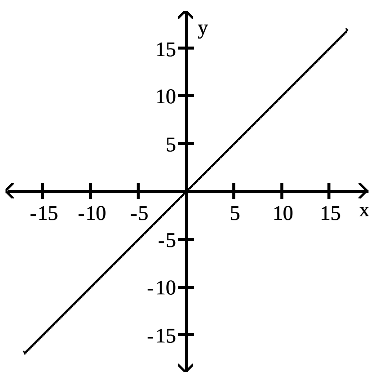
A)



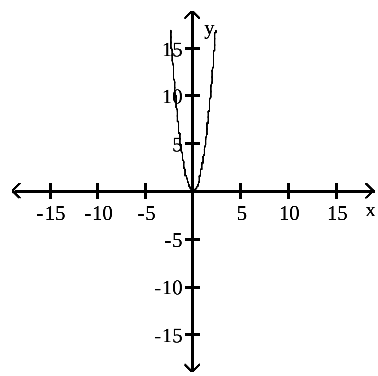
B)



C)

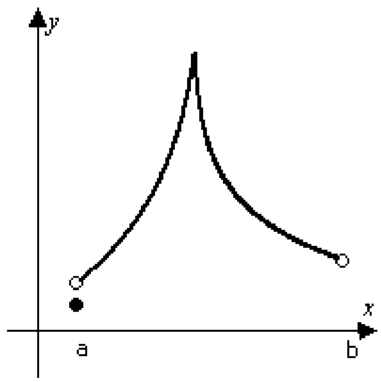


D)



Determine from the graph whether the function has any absolute extreme values on the interval [a, b].

9) 9) ________



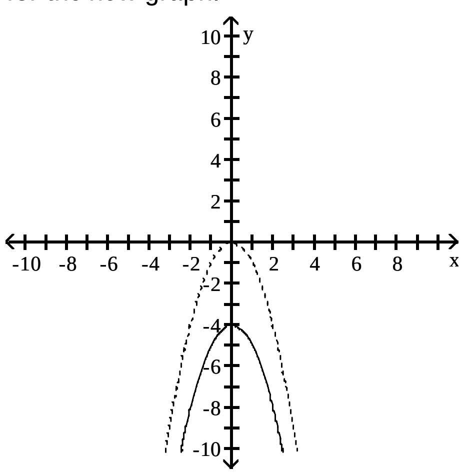
A) Absolute minimum and absolute maximum.
B) Absolute minimum only.
C) Absolute maximum only.
D) No absolute extrema.

Solve the problem.

10) If $f(x) = \sqrt{x + 3}$ and $g(x) = 8x - 7$, find $f(g(x))$. 10) ________

A) $2\sqrt{2x - 1}$ B) $2\sqrt{2x + 1}$ C) $8\sqrt{x - 4}$ D) $8\sqrt{x + 3} - 7$

11) The accompanying figure shows the graph of $y = -x^2$ shifted to a new position. Write the equation for the new graph. 11) ________



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

Find the domain and range of the function.

12) $g(z) = \sqrt{16 - z^2}$ 12) ________

A) D: $[0, \infty)$, R: $(-\infty, \infty)$ B) D: $[-4, 4]$, R: $[0, 4]$
C) D: $(-4, 4)$, R: $(-4, 4)$ D) D: $(-\infty, \infty)$, R: $(0, 4)$

For the given function, simplify the expression $\dfrac{f(x + h) - f(x)}{h}$.

13) $f(x) = 8x - 17$ 13) ________

A) $8x$ B) -9 C) 8 D) -8

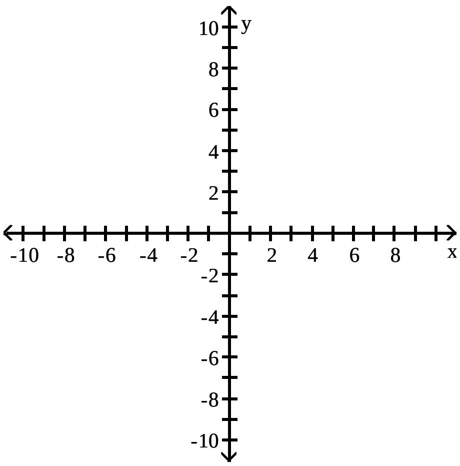
Find the domain and range of the function.

14) $g(z) = \dfrac{-10}{\sqrt{z + 1}}$ 14) _______

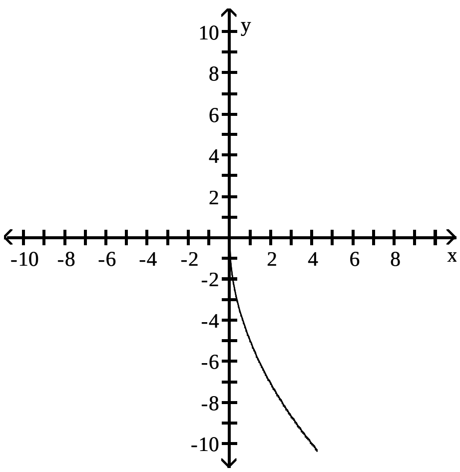
A) D: $[1,\infty)$, R: $(-\infty,\infty)$
B) D: $(-\infty,-1)$, R: $(0,\infty)$
C) D: $[0,\infty)$, R: $(-\infty,\infty)$
D) D: $(-1,\infty)$, R: $(-\infty,0)$

Graph the function. Determine the symmetry, if any, of the function.

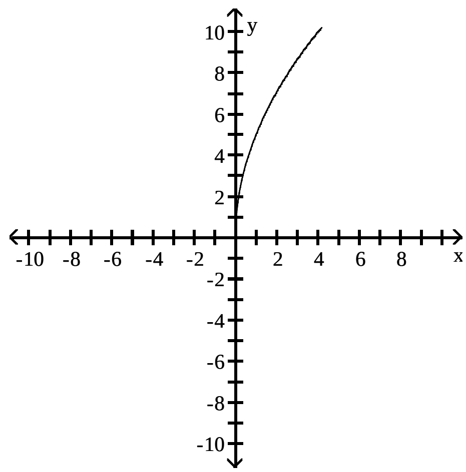
15) $y = 5\sqrt{x}$ 15) _______



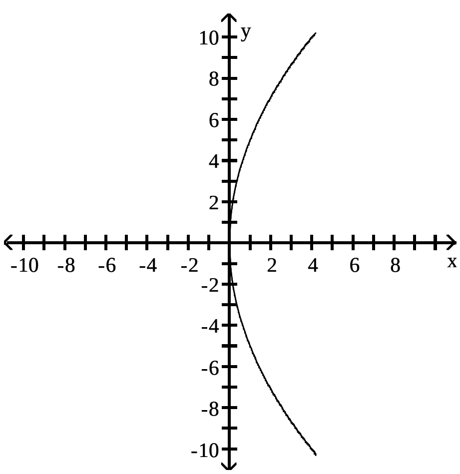
A) No symmetry



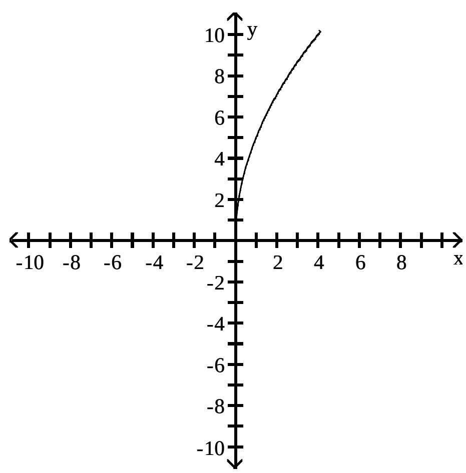
B) Symmetric about the x-axis



C) Symmetric about the x-axis



D) No symmetry



Describe how to transform the graph of f into the graph of g.

16) $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{2}\sqrt{x}$ 16) _______

A) Vertical scaling by a factor of $\frac{1}{2}$

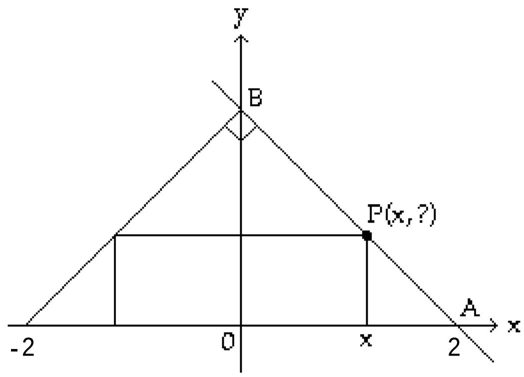
B) Horizontal scaling by a factor of 2

C) Horizontal scaling by a factor of $\frac{1}{2}$

D) Vertical scaling by a factor of 2

Solve the problem.

17) The figure shown here shows a rectangle inscribed in an isosceles right triangle whose hypotenuse is 4 units long. Express the area A of the rectangle in terms of x. 17) _______



A) $A(x) = 2x(x - 2)$

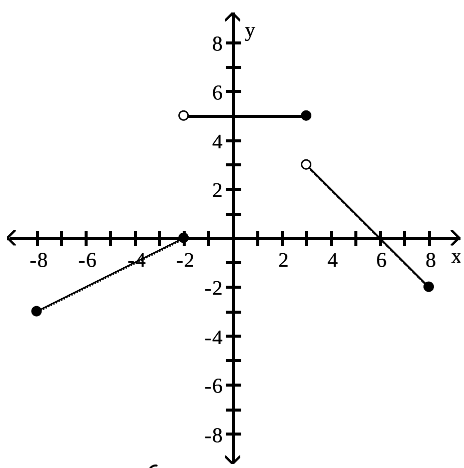
B) $A(x) = 2x(2 - x)$

C) $A(x) = x(2 - x)$

D) $A(x) = 2x^2$

Find a formula for the function graphed.

18) 18) _______



A) $f(x) = \begin{cases} -\frac{1}{2}x + 1, & -8 \le x \le -2 \\ 5, & -2 < x \le 3 \\ x - 6, & 3 < x \le 8 \end{cases}$

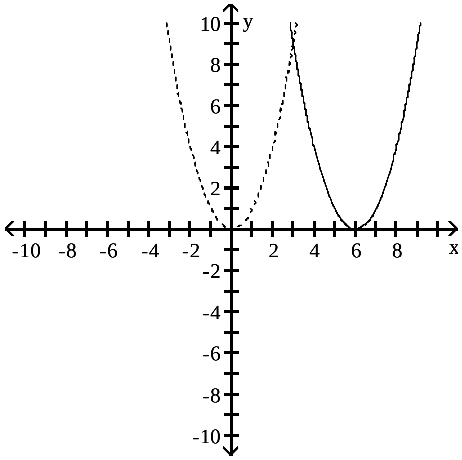
B) $f(x) = \begin{cases} \frac{1}{2}x + 1, & -8 \le x \le -2 \\ 5, & -2 < x < 3 \\ 6 - x, & 3 \le x \le 8 \end{cases}$

C) $f(x) = \begin{cases} \frac{1}{2}x + 1, & -8 \le x \le -2 \\ 5, & -2 < x \le 3 \\ 6 - x, & 3 < x \le 8 \end{cases}$

D) $f(x) = \begin{cases} \frac{1}{2}x + 1, & -8 < x \le -2 \\ 5, & -2 < x \le 3 \\ 6 - x, & 3 < x < 8 \end{cases}$

Solve the problem.

19) The accompanying figure shows the graph of $y = x^2$ shifted to a new position. Write the equation for the new graph. 19) _______



A) $y = (x - 6)^2$ B) $y = (x + 6)^2$ C) $y = x^2 - 6$ D) $y = x^2 + 6$

Find all vertical asymptotes of the given function.

20) $R(x) = \dfrac{x - 1}{x^3 + 5x^2 - 84x}$ 20) _______

A) $x = -7, x = -30, x = 12$
B) $x = -12, x = 7$
C) $x = -12, x = 0, x = 7$
D) $x = -7, x = 0, x = 12$

Find the limit, if it exists.

21) $\lim\limits_{x \to 1} \dfrac{x^2 + 4x - 5}{x^2 + 3x - 4}$ 21) _______

A) $\dfrac{6}{5}$ B) $-\dfrac{4}{5}$ C) $-\dfrac{6}{5}$ D) Does not exist

Find the limit.

22) $\lim\limits_{x \to (-\pi/2)^-} \sec x$ 22) _______

A) 1 B) 0 C) $-\infty$ D) ∞

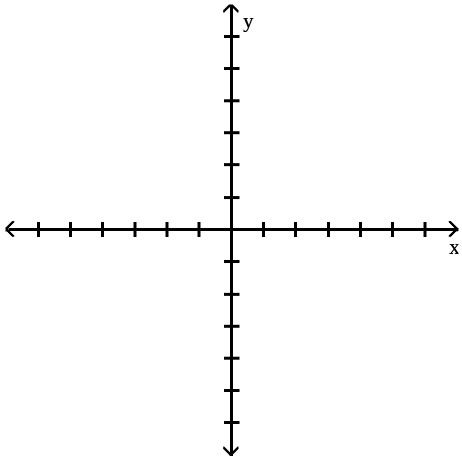
Find the slope of the curve for the given value of x.

23) $y = x^2 + 5x, x = 4$ 23) _______

A) slope is -39 B) slope is $\dfrac{1}{20}$ C) slope is $-\dfrac{4}{25}$ D) slope is 13

Determine the limit by sketching an appropriate graph.

24) $\lim_{x \to 7^+} f(x)$, where $f(x) = \begin{cases} -2x - 5 & \text{for } x < 7 \\ 2x - 4 & \text{for } x \geq 7 \end{cases}$ 24) _______



A) 10 B) -4 C) -3 D) -19

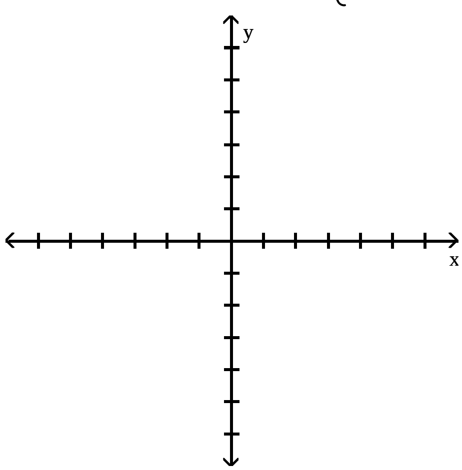
Find the limit.

25) $\lim_{x \to \infty} \dfrac{5x + 1}{11x - 7}$ 25) _______

A) ∞ B) 0 C) $-\dfrac{1}{7}$ D) $\dfrac{5}{11}$

Determine the limit by sketching an appropriate graph.

26) $\lim_{x \to -8^+} f(x)$, where $f(x) = \begin{cases} 2x & -8 \leq x < 0, \text{ or } 0 < x \leq 3 \\ 2 & x = 0 \\ 0 & x < -8 \text{ or } x > 3 \end{cases}$ 26) _______



A) -0 B) Does not exist C) -16 D) 5

Find all horizontal asymptotes of the given function, if any.

27) $h(x) = \dfrac{8x^3 - 3x}{9x^3 - 6x + 7}$ 27) _______

A) $y = 0$ B) $y = \dfrac{8}{9}$

C) $y = \dfrac{1}{2}$ D) no horizontal asymptotes

Give an appropriate answer.

28) Let $\lim\limits_{x \to -5} f(x) = -10$ and $\lim\limits_{x \to -5} g(x) = -8$. Find $\lim\limits_{x \to -5} [f(x) - g(x)]$. 28) _______

A) -2 B) -18 C) -10 D) -5

Find the limit.

29) $\lim\limits_{x \to -1^-} \dfrac{5}{x^2 - 1}$ 29) _______

A) ∞ B) $-\infty$ C) -1 D) 0

Find the intervals on which the function is continuous.

30) $y = \sqrt{x^2 - 2}$ 30) _______

A) continuous on the intervals $(-\infty, -\sqrt{2}]$ and $[\sqrt{2}, \infty)$

B) continuous everywhere

C) continuous on the interval $[\sqrt{2}, \infty)$

D) continuous on the interval $[-\sqrt{2}, \sqrt{2}]$

Find all horizontal asymptotes of the given function, if any.

31) $h(x) = \dfrac{8x^2 - 5x - 4}{4x^2 - 4x + 9}$ 31) _______

A) $y = \dfrac{5}{4}$ B) $y = 2$

C) $y = 0$ D) no horizontal asymptotes

Find the slope of the line tangent tangent to the graph a the given point.

32) $y = -2x - 2$, $x = -2$ 32) _______

A) $m = -2$ B) $m = 2$ C) $m = 4$ D) $m = -4$

Solve the problem.

33) At time $t \geq 0$, the velocity of a body moving along the s-axis is $v = t^2 - 9t + 8$. When is the body moving backward? 33) _______

A) $1 < t < 8$ B) $t > 8$ C) $0 \leq t < 8$ D) $0 \leq t < 1$

34) Suppose that the velocity of a falling body is $v = ks^2$ (k a constant) at the instant the body has fallen s meters from its starting point. Find the body's acceleration as a function of s. 34) _______

A) $a = 2ks^3$ B) $a = 2k^2s^3$ C) $a = 2ks$ D) $a = 2ks^2$

Find the indicated derivative.

35) Find y'' if $y = -4 \cos x$. 35) _______

A) $y'' = -4 \sin x$ B) $y'' = -4 \cos x$ C) $y'' = 4 \cos x$ D) $y'' = 4 \sin x$

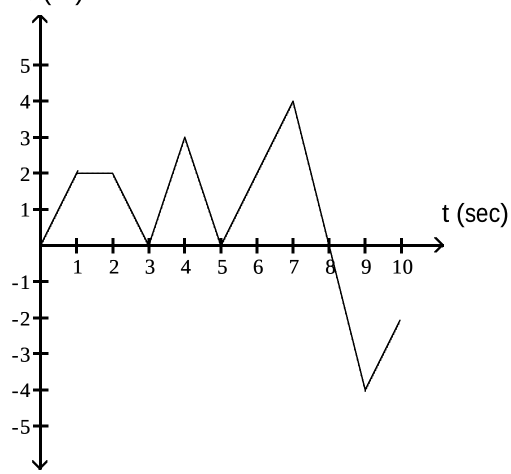
Solve the problem.

36) At time t, the position of a body moving along the s-axis is $s = t^3 - 12t^2 + 36t$ m. Find the total distance traveled by the body from t = 0 to t = 3. 36) _______

A) 63 m B) 59 m C) 31 m D) 27 m

The equation gives the position s = f(t) of a body moving on a coordinate line (s in meters, t in seconds).

37) 37) _______



When is the body moving backward?

A) 2 < t < 3, 4 < t < 5, 7 < t < 9 B) 8 < t < 9

C) 2 < t < 3, 4 < t < 5, 7 < t < 8 D) 8 < t ≤ 10

Solve the problem.

38) A heat engine is a device that converts thermal energy into other forms. The thermal efficiency, e, o a heat engine is defined by 38) _______

$$e = \frac{Q_h - Q_c}{Q_h},$$

where Q_h is the heat absorbed in one cycle and Q_c, the heat released into a reservoir in one cycle, is a constant. Find $\frac{d^2e}{dQ_h^2}$.

A) $\frac{d^2e}{dQ_h^2} = \frac{-2Q_c}{Q_h^3}$ B) $\frac{d^2e}{dQ_h^2} = \frac{Q_c}{Q_h^2}$ C) $\frac{d^2e}{dQ_h^2} = \frac{Q_c}{Q_h^3}$ D) $\frac{d^2e}{dQ_h^2} = \frac{-Q_c}{2Q_h^2}$

39) The position(in feet) of an object oscillating up and down at the end of a spring is given by $s = A \sin\left(\sqrt{\frac{k}{m}}t\right)$ at time t (in seconds). The value of A is the amplitude of the motion, k is a measure of the stiffness of the spring, and m is the mass of the object. Find the object's velocity at time t. 39) _______

A) $v = A\sqrt{\frac{k}{m}} \cos\left(\sqrt{\frac{k}{m}}t\right)$ ft/sec
B) $v = A\sqrt{\frac{m}{k}} \cos\left(\sqrt{\frac{k}{m}}t\right)$ ft/sec
C) $v = -A\sqrt{\frac{k}{m}} \cos\left(\sqrt{\frac{k}{m}}t\right)$ ft/sec
D) $v = A \cos\left(\sqrt{\frac{k}{m}}t\right)$ ft/sec

Use implicit differentiation to find dy/dx and d^2y/dx^2.

40) $4\sqrt{y} - y = 2x$ 40) _______

A) $\frac{dy}{dx} = \frac{2 - \sqrt{y}}{2\sqrt{y}}; \frac{d^2y}{dx^2} = \frac{2 - \sqrt{y}}{4y}$
B) $\frac{dy}{dx} = \frac{2\sqrt{y}}{2 - \sqrt{y}}; \frac{d^2y}{dx^2} = \frac{2 - 2\sqrt{y}}{\sqrt{y}(2 - \sqrt{y})^2}$
C) $\frac{dy}{dx} = \frac{2\sqrt{y}}{2 - \sqrt{y}}; \frac{d^2y}{dx^2} = \frac{4}{(2 - \sqrt{y})^3}$
D) $\frac{dy}{dx} = \frac{2}{\sqrt{y}} - 2; \frac{d^2y}{dx^2} = -\frac{2}{y^2}$

Solve the problem. Round your answer, if appropriate.

41) Boyle's law states that if the temperature of a gas remains constant, then PV = c, where P = pressure, V = volume, and c is a constant. Given a quantity of gas at constant temperature, if V is decreasing at a rate of 15 in.^{3}/sec, at what rate is P increasing when P = 40 lb/in.^{2} and V = 20 in.^{3}? (Do not round your answer.) 41) _______

A) $\frac{15}{2}$ lb/in.^{2} per sec
B) 30 lb/in.^{2} per sec
C) 4 lb/in.^{2} per sec
D) $\frac{160}{3}$ lb/in.^{2} per sec

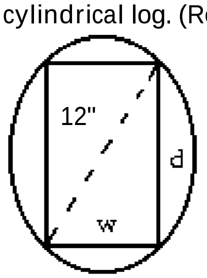
Solve the initial value problem.

42) $\frac{dr}{dt} = 4t + \sec^2 t, \ r(-\pi) = 1$ 42) _______

A) $r = 2t^2 + \cot t + 1 - 2\pi^2$
B) $r = 4 + \tan t - 3$
C) $r = 4t^2 + \tan t + 1 - 4\pi^2$
D) $r = 2t^2 + \tan t + 1 - 2\pi^2$

Solve the problem.

43) The strength S of a rectangular wooden beam is proportional to its width times the square of its depth. Find the dimensions of the strongest beam that can be cut from a 12-in.-diameter cylindrical log. (Round answers to the nearest tenth.) 43) _______



A) w = 5.9 in.; d = 10.8 in.
B) w = 6.9 in.; d = 9.8 in.
C) w = 7.9 in.; d = 10.8 in.
D) w = 7.9 in.; d = 8.8 in.

Use differentiation to determine whether the integral formula is correct.

44) $\int \frac{2}{(x+2)^3}\,dx = -\frac{1}{(x+2)^2} + C$ 44) _______

A) Yes B) No

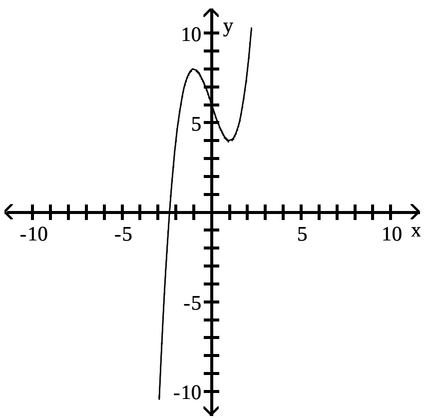
Determine all critical points for the function.

45) $f(x) = \frac{3x}{x-7}$ 45) _______

A) $x = -7$
B) $x = 7$
C) $x = 0$ and $x = 7$
D) $x = -21$ and $x = 0$

Use the graph of the function f(x) to locate the local extrema and identify the intervals where the function is concave up and concave down.

46) 46) _______



A) Local minimum at $x = 1$; local maximum at $x = -1$; concave down on $(-\infty, \infty)$
B) Local minimum at $x = 1$; local maximum at $x = -1$; concave up on $(-\infty, \infty)$
C) Local minimum at $x = 1$; local maximum at $x = -1$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$
D) Local minimum at $x = 1$; local maximum at $x = -1$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$

Solve the problem.

47) Given the velocity and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 47) _______
$v = -10t + 5$, $s(0) = 10$

A) $s = -5t^2 + 5t + 10$
B) $s = -5t^2 + 5t - 10$
C) $s = 5t^2 + 5t - 10$
D) $s = -10t^2 + 5t + 10$

48) A company is constructing an open-top, square-based, rectangular metal tank that will have a volume of 30 ft^3. What dimensions yield the minimum surface area? Round to the nearest tenth, if necessary. 48) _______

A) 3.9 ft × 3.9 ft × 2 ft
B) 7.7 ft × 7.7 ft × 0.5 ft
C) 3.1 ft × 3.1 ft × 3.1 ft
D) 4.5 ft × 4.5 ft × 1.5 ft

49) From a thin piece of cardboard 10 in. by 10 in., square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary. 49) _______

A) 6.7 in. × 6.7 in. × 1.7 in.; 74.1 in^3
B) 6.7 in. × 6.7 in. × 3.3 in.; 148.1 in^3
C) 3.3 in. × 3.3 in. × 3.3 in.; 37 in^3
D) 5 in. × 5 in. × 2.5 in.; 62.5 in^3

50) Suppose that g is continuous and that $\int_4^7 g(x)\,dx = 10$ and $\int_4^{10} g(x)\,dx = 13$. Find $\int_{10}^7 g(x)\,dx$. 50) _______

A) -3
B) 23
C) -23
D) 3

Use a finite approximation to estimate the area under the graph of the given function on the stated interval as instructed.

51) $f(x) = x^2$ between x = 2 and x = 6 using a left sum with four rectangles of equal width. 51) _______

A) 86
B) 69
C) 54
D) 62

Use the substitution formula to evaluate the integral.

52) $\int_{-1}^{0} \frac{3t}{\left(4 + t^2\right)^4}\,dt$ 52) _______

A) $-\frac{183}{8000}$
B) $\frac{61}{16000}$
C) $-\frac{61}{16000}$
D) $-\frac{61}{8000}$

Evaluate the integral by using multiple substitutions.

53) $\int \sqrt{6 + \sin^2 (x - 5)} \sin (x - 5) \cos (x - 5)\,dx$ 53) _______

A) $(6 + \cos^2 (x - 5))^{3/2} + C$
B) $\frac{3}{4}\sqrt{6 + \sin^2(x - 5)} + C$
C) $\frac{1}{3}(6 + \sin^2 x)^{3/2} + C$
D) $\frac{1}{3}(6 + \sin^2 (x - 5))^{3/2} + C$

Evaluate the sum.

54) $\sum_{k=3}^{16} 4$ 54) _______

A) 52
B) 56
C) 64
D) 61

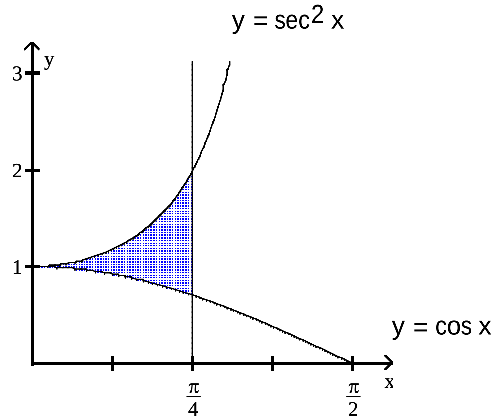
Find the length of the curve.

55) $y = 2x^{3/2}$ from $x = 0$ to $x = \frac{5}{4}$ 55) _______

A) $\frac{335}{72}$
B) $\frac{335}{3}$
C) $\frac{9}{4}$
D) $\frac{335}{108}$

Find the area of the shaded region.

56) 56) _______



A) $1 + \sqrt{2}$ B) $\frac{\sqrt{2}}{2}$ C) $1 - \frac{\sqrt{2}}{2}$ D) $2 - \sqrt{2}$

Evaluate the integral.

57) $\int x^4 e^{-x^5}\, dx$ 57) _______

A) $-\frac{1}{5}e^{-x^6} + C$ B) $e^{-x^5} + C$ C) $-5e^{-x^6} + C$ D) $-\frac{1}{5}e^{-x^5} + C$

Evaluate or simplify the given expression.

58) $\sin(3 \sin^{-1} x)$ 58) _______

A) $3x - 3x^3$ B) $3x - 4x^3$

C) $1 - 2x - 2x^2 - 2x^3$ D) $2 + x - 2x^2 - 2x^3$

59) $\sin(\tan^{-1} x)$ 59) _______

A) $\frac{x\sqrt{x^2 + 1}}{x^2 + 1}$ B) $\sqrt{x^2 - 1}$ C) $\frac{\sqrt{x^2 - 1}}{x}$ D) $\sqrt{x^2 + 1}$

Evaluate the integral.

60) $\int_1^{e^5} \frac{4}{t}\, dt$ 60) _______

A) 20 B) $\frac{2}{2e^{10}} - \frac{1}{2}$ C) $4 \ln 5$ D) 5

61) $\int_1^2 \frac{x^4 + 1}{x^5 + 5x}\, dx$ 61) _______

A) $\frac{1}{5} \ln\left|\frac{3}{34}\right|$ B) $\frac{1}{2} \ln|2|$ C) $\frac{1}{5} \ln\left|\frac{1}{2}\right|$ D) $\frac{1}{5} \ln|7|$

Find the value of df^{-1}/dx at $x = f(a)$.

62) $f(x) = 2x^2$, $x \geq 0$, $a = 4$ 62) _______

A) $\frac{3}{128}$ B) 16 C) $\frac{1}{4}$ D) $\frac{1}{16}$

Solve the problem.

63) Let $g(x) = \sqrt{x}$. Find a function $y = f(x)$ so that $(f \circ g)(x) = |x|$. 63) _______

A) $f(x) = \frac{1}{x^2}$ B) $f(x) = x$ C) $f(x) = x^2$ D) $f(x) = \frac{1}{x}$

64) If $f(x) = 7x - 9$ and $g(x) = 8x^2 - 9x + 8$, find $g(f(6))$. 64) _______

A) 5 B) -25 C) 8423 D) 1685

65) If $f(x) = \sqrt{x}$, $g(x) = \frac{x}{5}$, and $h(x) = 5x + 20$, find $f(g(h(x)))$. 65) _______

A) $\sqrt{x + 20}$ B) $\sqrt{x + 4}$ C) $\sqrt{x} + 4$ D) $5\sqrt{x} + 20$

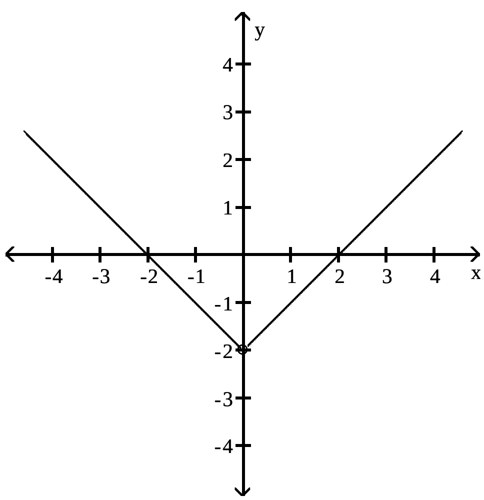
Find the limit.

66) $\lim\limits_{x \to 0} \frac{\sqrt{1 + x} - 1}{x}$ 66) _______

A) 0 B) 1/4 C) 1/2 D) Does not exist

Use the graph to evaluate the limit.

67) $\lim\limits_{x \to 0} f(x)$ 67) _______



A) -1 B) 2 C) does not exist D) -2

Find the limit.

68) $\lim\limits_{x \to 0^+} (1 + \csc x)$ 68) _______

A) ∞ B) 1 C) 0 D) Does not exist

69) $\lim\limits_{x \to 0} (1 - \cot x)$ 69) _______

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

Suppose that the functions f and g and their derivatives with respect to x have the following values at the given values of x. Find the derivative with respect to x of the given combination at the given value of x.

70) 70) _______

x	f(x)	g(x)	f ′(x)	g ′(x)
3	1	9	6	7
4	3	3	2	-6

$f^2(x) \cdot g(x)$, x = 3

A) 115 B) 61 C) 84 D) 25

Suppose u and v are differentiable functions of x. Use the given values of the functions and their derivatives to find the value of the indicated derivative.

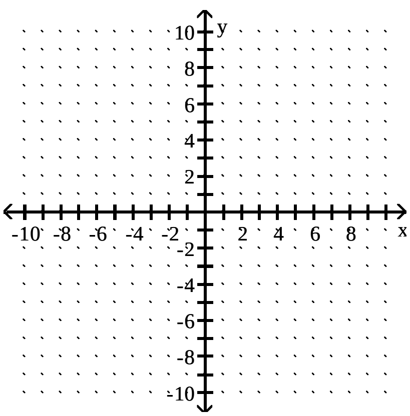
71) u(1) = 4, u ′(1) = -6, v(1) = 7, v ′(1) = -3. 71) _______

$\frac{d}{dx}(2u - 4v)$ at x = 1

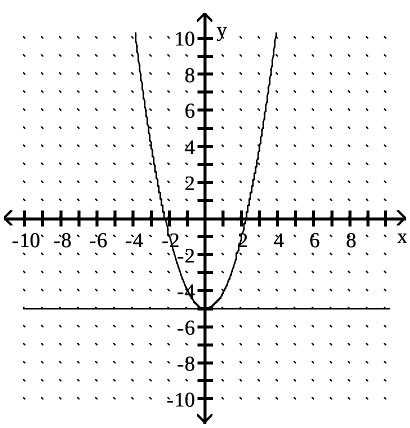
A) -20 B) -24 C) 0 D) 36

Graph the equation and its tangent.

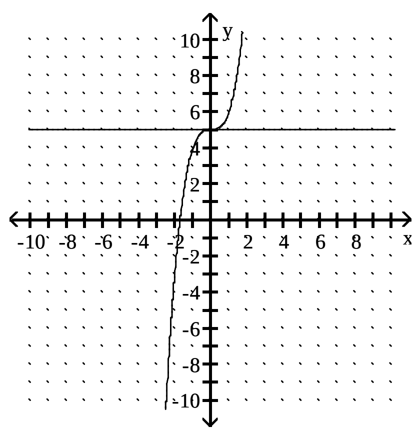
72) Graph $y = x^3 + 5$ and the tangent to the curve at the point whose x-coordinate is 0. 72) _______



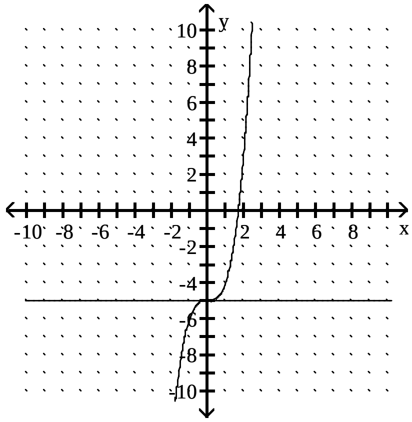
A)



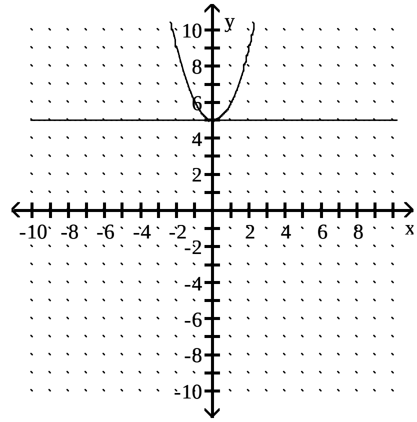
B)



C)



D)



Solve the problem.

73) Find the optimum number of batches (to the nearest whole number) of an item that should be produced annually (in order to minimize cost) if 300,000 units are to be made, it costs $2 to store a unit for one year, and it costs $440 to set up the factory to produce each batch. 73) _______

A) 20 batches B) 28 batches C) 26 batches D) 18 batches

Find the point(s) at which the given function equals its average value on the given interval.

74) $f(x) = |x|$; [0, 12] 74) _______

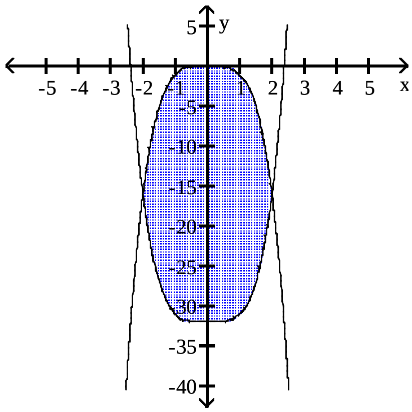
A) $\frac{13}{2}$ B) 5 C) 7 D) 6

Find the area of the shaded region.

75) 75) _______

A) 12.5 B) 5 C) 10 D) 7.5

76) $y = x^4 - 32$ 76) _______



$y = -x^4$

A) $\frac{512}{5}$ B) $\frac{516}{5}$ C) $\frac{256}{5}$ D) $\frac{2816}{5}$

Evaluate the integral.

77) $\int_0^{\sqrt{\ln \pi}} 2x\, e^{x^2} \sin\left(e^{x^2}\right) dx$ 77) _______

A) 1 B) $1 - \cos 1$ C) $1 + \cos 1$ D) -1

Find all vertical asymptotes of the given function.

78) $f(x) = \frac{x - 2}{4x - x^3}$ 78) _______

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

Calculate the derivative of the function. Then find the value of the derivative as specified.

79) $\left.\frac{dr}{dt}\right|_{t=3}$ if $r = \frac{4}{\sqrt{28 - t}}$ 79) _______

A) $\frac{dr}{dt} = \frac{2}{(28 - t)^{3/2}}; \left.\frac{dr}{dt}\right|_{t=3} = \frac{2}{125}$ B) $\frac{dr}{dt} = -\frac{4}{(28 - t)^{3/2}}; \left.\frac{dr}{dt}\right|_{t=3} = -\frac{4}{125}$

C) $\frac{dr}{dt} = -\frac{2}{(28 - t)^{3/2}}; \left.\frac{dr}{dt}\right|_{t=3} = -\frac{2}{125}$ D) $\frac{dr}{dt} = \frac{4}{(28 - t)^{3/2}}; \left.\frac{dr}{dt}\right|_{t=3} = \frac{4}{125}$

Evaluate the integral.

80) $\int x^3 \sqrt{x^4 + 8}\, dx$ 80) _______

A) $-\frac{1}{2}\left(x^4 + 8\right)^{-1/2} + C$ B) $\frac{8}{3}\left(x^4 + 8\right)^{3/2} + C$

C) $\frac{1}{6}\left(x^4 + 8\right)^{3/2} + C$ D) $\frac{2}{3}\left(x^4 + 8\right)^{3/2} + C$

Set up an integral for the length of the curve.

81) $x = 3 \tan y,\ 0 \le y \le \frac{\pi}{4}$ 81) _______

A) $\int_0^{\pi/4} \sqrt{1 + 9 \sec^2 y}\ dy$ B) $\int_0^{\pi/4} \sqrt{1 + 9 \sec^4 y}\ dy$

C) $\int_0^{\pi/4} \sqrt{1 + 3 \sec^4 y}\ dy$ D) $\int_0^{\pi/4} \sqrt{1 - 9 \sec^2 y}\ dy$

Evaluate the integral.

82) $\int_1^2 21x^2 2^{x^3}\ dx$ 82) _______

A) $\frac{1778}{\ln 2}$ B) $\frac{7}{\ln x} + C$ C) $\frac{42}{\ln 2}$ D) 1778

Find all points where the function is discontinuous.

83) 83) _______

A) $x = -2, x = 2$ B) $x = -2, x = 0, x = 2$

C) None D) $x = 0$

Solve the problem.

84) The number of gallons of water in a swimming pool t minutes after the pool has started to drain is $Q(t) = 50(20 - x)^2$. How fast is the water running out at the end of 15 minutes? 84) _______

A) 1250 gal/min B) 625 gal/min C) 250 gal/min D) 500 gal/min

Evaluate the integral by using multiple substitutions.

85) $\int 5(3x^2 - 7) \sin^5 (x^3 - 7x) \cos (x^3 - 7x)\ dx$ 85) _______

A) $\frac{5}{6} \cos^6 (3x^2) + C$ B) $25 \sin^4 (x^3 - 7x) + C$

C) $\frac{5}{6} \sin^6 (x^3 - 7x) + C$ D) $\frac{6}{5} \sin^6 (x^3 - 7x) + C$

Solve the problem.

86) A fisherman is about to reel in a 6-lb fish located 12 ft directly below him. If the fishing line weighs 1 oz per foot, how much work will it take to reel in the fish? Round your answer to the nearest tenth, if necessary. 86) _______

A) 144 ft • lb B) 76.5 ft • lb C) 84 ft • lb D) 81 ft • lb

1) C
2) D
3) A
4) D
5) B
6) B
7) C
8) A
9) A
10) A
11) A
12) B
13) C
14) D
15) D
16) A
17) B
18) C
19) A
20) C
21) A
22) D
23) D
24) A
25) D
26) C
27) B
28) A
29) A
30) A
31) B
32) A
33) A
34) C
35) C
36) B
37) A
38) A
39) A
40) C
41) B
42) D
43) B
44) A
45) B
46) C
47) A
48) A
49) A
50) A

51) C
52) C
53) D
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82) A
83) D
84) D
85) C
86) B