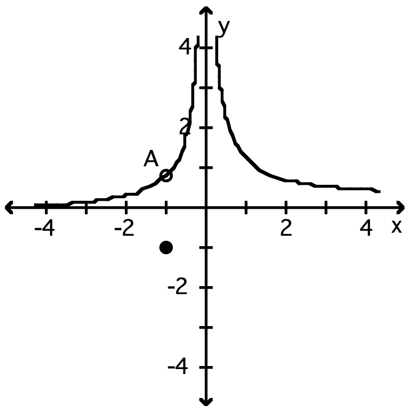
Review for Final Exam

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

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

1) Find $\lim_{x \to -1} f(x)$ and $f(-1)$. 1) ______



A is the point $\left(-1, \frac{4}{5}\right)$

A) $-1; \frac{4}{5}$

B) Does not exist; -1

C) $\frac{4}{5}$; does not exist

D) $\frac{4}{5}$; -1

Use the table to find the indicated limit.

2) If $f(x) = \frac{\sin(8x)}{x}$, find $\lim_{x \to 0} f(x)$. 2) ______

x	−0.1	−0.01	−0.001	0.001	0.01	0.1
f(x)		7.9914694			7.9914694	

A) limit = 0

B) limit = 8

C) limit = 7.5

D) limit does not exist

Find the indicated limit.

3) $\lim_{x \to 3} (x^2 - 3x - 1.)$ 3) ______

A) 1

B) −1

C) 19

D) Does not exist

4) $\lim_{x \to 3} \frac{x^2 - 9}{x^2 - 4x + 3}$ 4) ______

A) 0

B) 3

C) $\frac{3}{2}$

D) Does not exist

Find the limit.

5) $\lim_{x \to 0} \dfrac{\sqrt{1+x}-1}{x}$ 5) ______

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

6) $\lim_{x \to 5^-} \dfrac{1}{(x-5)^2}$ 6) ______

A) ∞ B) $-\infty$ C) -1 D) 0

Find a value for a so that the function f(x) is continuous.

7) $f(x) = \begin{cases} x^2 + x + a, & x < -2 \\ x^3, & x \geq -2 \end{cases}$ 7) ______

A) $a = -10$ B) $a = -8$ C) $a = 2$ D) $a = -6$

Find $D_x y$.

8) $y = \frac{1}{2}x^{10} - \frac{1}{5}x^5$ 8) ______

A) $5x^9 - x^4$ B) $5x^{10} - x^5$ C) $\frac{1}{2}x^9 - \frac{1}{5}x^4$ D) $5x^{11} - x^6$

Find the slope of the curve at the point indicated.

9) $y = 8\sqrt{x}$, $x = 4$ 9) ______

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

Find an equation for the tangent to the curve at the given point.

10) $y = x^2 - x$, $(-3, 12)$ 10) ______

A) $y = -7x - 9$ B) $y = -7x + 9$ C) $y = -7x + 6$ D) $y = -7x - 6$

Find $D_x y$.

11) $y = (5 - 3x^2)(5x^2 - 60)$ 11) ______

A) $-60x^3 + 410x$ B) $-60x^3 + 410$ C) $15x^3 + 205x$ D) $-60x^4 + 410x^2$

12) $y = \dfrac{x+2}{x-2}$ 12) ______

A) $\dfrac{-2}{(x-2)^2}$ B) $\dfrac{-4}{(x+2)^2}$ C) $\dfrac{-4}{(x-2)^2}$ D) $\dfrac{2}{x-2}$

Find the indicated derivative of the function.

13) $\dfrac{d^2y}{dx^2}$ for $y = 3x \sin x$ 13) ______

A) $-3x \sin x$ B) $3 \cos x - 6x \sin x$

C) $6 \cos x - 3x \sin x$ D) $-6 \cos x + 3x \sin x$

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

14) $s = 3t^2 + 2t + 3,\ 0 \le t \le 2$ 14) ______

Find the body's speed and acceleration at the end of the time interval.

A) 14 m/sec, 12 m/sec^2 B) 8 m/sec, 2 m/sec^2

C) 17 m/sec, 6 m/sec^2 D) 14 m/sec, 6 m/sec^2

Solve the problem.

15) The driver of a car traveling at 48 ft/sec suddenly applies the brakes. The position of the car is $s = 48t - 3t^2$, t seconds after the driver applies the brakes. How many seconds after the driver applies the brakes does the car come to a stop? 15) ______

A) 48 sec B) 16 sec C) 24 sec D) 8 sec

Find the derivative.

16) $s = t^5 - \csc t + 17$ 16) ______

A) $\dfrac{ds}{dt} = t^4 - \cot^2 t + 17$ B) $\dfrac{ds}{dt} = 5t^4 + \cot^2 t$

C) $\dfrac{ds}{dt} = 5t^4 + \csc t \cot t$ D) $\dfrac{ds}{dt} = 5t^4 - \csc t \cot t$

Write the function in the form $y = f(u)$ and $u = g(x)$. Then find dy/dx as a function of x.

17) $y = (-3x + 8)^6$ 17) ______

A) $y = u^6;\ u = -3x + 8;\ \dfrac{dy}{dx} = 6(-3x + 8)^5$ B) $y = u^6;\ u = -3x + 8;\ \dfrac{dy}{dx} = -18(-3x + 8)^5$

C) $y = u^6;\ u = -3x + 8;\ \dfrac{dy}{dx} = -3(-3x + 8)^6$ D) $y = 6u + 8;\ u = x^6;\ \dfrac{dy}{dx} = -18x^5$

18) $y = \cot(5x - 7)$ 18) ______

A) $y = \cot u;\ u = 5x - 7;\ \dfrac{dy}{dx} = -\csc^2(5x - 7)$

B) $y = \cot u;\ u = 5x - 7;\ \dfrac{dy}{dx} = -5\cot(5x - 7)\csc(5x - 7)$

C) $y = 5u - 7;\ u = \cot x;\ \dfrac{dy}{dx} = -5\cot x \csc^2 x$

D) $y = \cot u;\ u = 5x - 7;\ \dfrac{dy}{dx} = -5\csc^2(5x - 7)$

Find dy/dt.

19) $y = \cos^5(\pi t - 18)$ 19) ______

A) $-5\pi \cos^4(\pi t - 18)\sin(\pi t - 18)$ B) $-5\cos^4(\pi t - 18)\sin(\pi t - 18)$

C) $-5\pi \sin^4(\pi t - 18)$ D) $5\cos^4(\pi t - 18)$

Find $D_x y$.

20) $y = 2x(4x + 2)^5$ 20) ______

A) $2(24x + 2)^4$

B) $2(4x + 2)^4(24x + 2)$

C) $2(4x + 2)^4$

D) $2(4x + 2)^5(9x + 2)$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

21) Use the Intermediate Value Theorem to prove that $9x^4 + 5x^3 - 8x - 7 = 0$ has a solution between -1 and 0. 21) ______________

22) Use the Intermediate Value Theorem to prove that $x(x - 4)^2 = 4$ has a solution between 3 and 5. 22) ______________

23) Use the Intermediate Value Theorem to prove that $4 \sin x = x$ has a solution between $\frac{\pi}{2}$ and π. 23) ______________

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

24) $f(x) = 4x - 18$ 24) ______________

25) $f(x) = x^2 + 8$ 25) ______________

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

Find the derivative of y with respect to x.

26) $y = 2 \sin^{-1}(4x^3)$ 26) ______

A) $\frac{2}{\sqrt{1 - 16x^6}}$ B) $\frac{24x^2}{\sqrt{1 - 16x^6}}$ C) $\frac{24x^2}{1 - 16x^6}$ D) $\frac{24x^2}{\sqrt{1 - 16x^3}}$

Use implicit differentiation to find dy/dx.

27) $x^5 = \cot y$ 27) ______

A) $-\frac{5x^4}{\csc y \cot y}$ B) $\frac{5x^4}{\csc^2 y}$ C) $\frac{\csc^2 y}{5x^4}$ D) $-\frac{5x^4}{\csc^2 y}$

At the given point, find the equation of the tangent line, as requested.

28) $y^5 + x^3 = y^2 + 9x$, tangent at (0, 1) 28) ______

A) $y = -\frac{9}{7}x$ B) $y = \frac{9}{5}x + 1$ C) $y = -\frac{9}{5}x - 1$ D) $y = 3x + 1$

Find the derivative.

29) $f(x) = \frac{3e^x}{2e^x + 1}$ 29) ______

A) $\frac{3e^x}{(2e^x + 1)}$ B) $\frac{3e^x}{(2e^x + 1)^3}$ C) $\frac{e^x}{(2e^x + 1)^2}$ D) $\frac{3e^x}{(2e^x + 1)^2}$

Find an equation of the line tangent to the given curve at the point (a, f(a)).

30) $f(x) = e^{8x}$, $a = 0$ 30) ______

A) $y = 8e + 1$ B) $y = 8x + 8$ C) $y = 8x + 1$ D) $y = x + 1$

Find the derivative of y with respect to x, t, or θ, as appropriate.

31) $y = \ln 5x$ 31) ______

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

32) $y = x^4 \ln x - \frac{1}{3}x^3$ 32) ______

A) $x^4 \ln x - x^2 + 4x^3$ B) $4x^3 - x^2$
C) $5x^3 - x^2$ D) $x^3 - x^2 + 4x^3 \ln x$

Solve the problem. Round your answer, if appropriate.

33) A ladder is slipping down a vertical wall. If the ladder is 15 ft long and the top of it is slipping at the constant rate of 2 ft/s, how fast is the bottom of the ladder moving along the ground when the bottom is 12 ft from the wall? 33) ______

A) 0.8 ft/s B) 1.5 ft/s C) 2.5 ft/s D) 0.17 ft/s

Solve the problem.

34) Water is falling on a surface, wetting a circular area that is expanding at a rate of 2 mm^2/s. How fast is the radius of the wetted area expanding when the radius is 159 mm? (Round your answer to four decimal places.) 34) ______

A) 0.0020 mm/s B) 0.0126 mm/s

C) 499.5128 mm/s D) 0.0040 mm/s

Find the linearization L(x) of f(x) at x = a.

35) $f(x) = \tan x$, $a = \pi$ 35) ______

A) $L(x) = x - 3\pi$ B) $L(x) = 3x - \pi$ C) $L(x) = x + \pi$ D) $L(x) = x - \pi$

Solve the problem.

36) $V = \frac{4}{3}\pi r^3$, 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.) 36) ______

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

Determine all critical points for the function.

37) $f(x) = x^3 - 9x^2 + 9$ 37) ______

A) $x = 0$ and $x = 6$ B) $x = 0$ and $x = 3$

C) $x = -3$ and $x = 3$ D) $x = 0$

Identrify the critical points and find the maximum and minimum value on the given interval I.

38) $f(x) = x^3 - 12x + 5$; $I = [-3, 5]$ 38) ______

A) Critical points: –3, –2, 2, 5; maximum value 70; minimum value 14

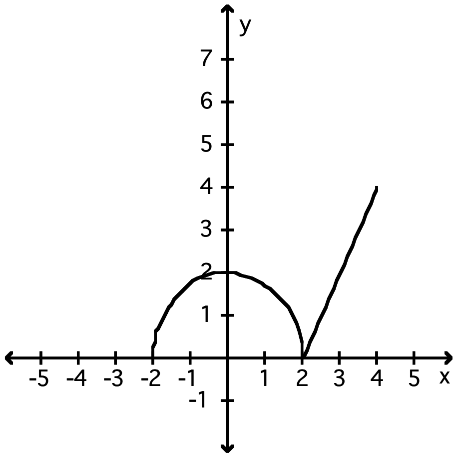
B) Critical points: –3, –2, 2, 5; maximum value 70; minimum value –11

C) Critical points: –2, 2; no maximum value; minimum value –11

D) Critical points: –2, 2; maximum value 21; minimum value –11

Find the open intervals on which the function is increasing and decreasing. Identify the function's local and absolute extreme values, if any, saying where they occur.

39) 39) ______



A) increasing on (–2, 0) and (2, 4); decreasing on (0, 2);
absolute maximum at (4, 4); absolute minimum at (–2, 0) and (2, 0)

B) increasing on (2, 4); decreasing on (0, 2);
absolute maximum at (4, 4); local maximum at (0, 2); absolute minimum at (–2, 0) and (2, 0)

C) increasing on (–2, 0) and (2, 4); decreasing on (0, 2);
absolute maximum at (4, 4) and(0,2); absolute minimum at (–2, 0) and (2, 0)

D) increasing on (–2, 0) and (2, 4); decreasing on (0, 2);
absolute maximum at (4, 4); local maximum at (0, 2); absolute minimum at (–2, 0) and (2, 0)

40) $h(z) = 27z - z^3$ 40) ______

A) Increasing on $(-\infty, -3] \cup [3, \infty)$, decreasing on $[-3, 3]$
B) Increasing on $[-9, 9]$, decreasing on $(-\infty, -9] \cup [9, \infty)$
C) Increasing on $(-\infty, 3]$, decreasing on $[3, \infty)$
D) Increasing on $[-3, 3]$, decreasing on $(-\infty, -3] \cup [3, \infty)$

41) $h(t) = \dfrac{1}{t^2 + 1}$ 41) ______

A) Increasing on $[0, \infty)$, decreasing on $(-\infty, 0]$
B) Increasing on $(-\infty, \infty)$
C) Increasing on $(-\infty, 1]$, decreasing on $[1, \infty)$
D) Increasing on $(-\infty, 0]$, decreasing on $[0, \infty)$

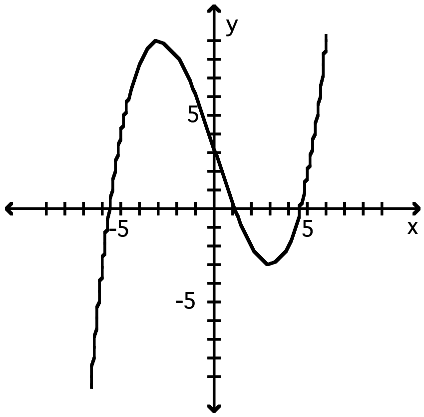
Find the extreme values of the function and where they occur.

42) $y = x^3 - 12x + 2$ 42) ______

A) None
B) Local maximum at (2, –14), local minimum at (–2, 18).
C) Local maximum at (0, 0).
D) Local maximum at (–2, 18), local minimum at (2, –14).

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.

43) 43) ______



A) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(-\infty, -3)$ and $(3, \infty)$; concave down on $(-3, 3)$

B) Local minimum at $x = 3$; local maximum at $x = -3$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

C) Local minimum at $x = 3$; local maximum at $x = -3$; concave down on $(-\infty, -3)$ and $(3, \infty)$; concave up on $(-3, 3)$

D) Local minimum at $x = 3$; local maximum at $x = -3$; concave down on $(0, \infty)$; concave up on $(-\infty, 0)$

Determine where the given function is concave up and where it is concave down.

44) $f(x) = x^3 + 12x^2 - x - 24$ 44) ______

A) Concave down on $(-\infty, -4)$ and $(4, \infty)$, concave up on $(-4, 4)$

B) Concave up on $(-4, \infty)$, concave down on $(-\infty, -4)$

C) Concave down for all x

D) Concave up on $(-\infty, -4)$, concave down on $(-4, \infty)$

Use the Concavity Theorem to determine where the given function is concave up and where it is concave down. Also find all inflection points.

45) $G(x) = \frac{1}{4}x^4 - x^3 + 8$ 45) ______

A) Concave up on $(0, 2)$, concave down on $(-\infty, 0) \cup (2, \infty)$; inflection points $(0, 8)$ and $(2, 4)$

B) Concave up on $(-\infty, 0) \cup (2, \infty)$, concave down on $(0, 2)$; inflection points $(0, 8)$ and $(2, 4)$

C) Concave up for $(-\infty, 0)$, concave down for $(0, \infty)$; inflection point $(0, 8)$

D) Concave up for $(2, \infty)$, concave down on $(-\infty, 2)$; inflection point $(2, 4)$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use Linear Approximation to calculate the given number.

46) $\sqrt{49.25}$ 46) ______________

Give your answer as a decimal. Round to 5 decimal places if necessary.

47) $\sqrt{9.44}$ 47) ______________

Give your answer as a decimal. Round to 4 decimal places if necessary.

For Questions 23, 24 and 25

Find the value or values of c that satisfy the equation $f'(c) = \frac{f(b) - f(a)}{b - a}$ in the conclusion of the Mean Value Theorem for the function and interval.

48) $f(x) = x^2 + 4x + 3$, $[2, 3]$ 48) ______________

49) $f(x) = \ln(x - 3)$, $[4, 6]$ Round to the nearest thousandth. 49) ______________

Find the value or values of c that satisfy the equation $f'(c) = \frac{f(b) - f(a)}{b - a}$ in the conclusion of the Mean Value Theorem for the function and interval.

50) $f(x) = x + \frac{96}{x}$, $[6, 16]$ 50) ______________

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

Find the limit.

51) $\lim_{x \to \infty} \frac{6x}{x - 14}$ 51) ______

A) 0 B) ∞ C) 6 D) $-\frac{3}{7}$

52) $\lim_{x \to -\infty} \frac{x}{4x - 10}$ 52) ______

A) $\frac{1}{4}$ B) $-\frac{1}{4}$ C) 0 D) ∞

53) $\lim_{x \to \infty} \frac{4x + 1}{16x - 7}$ 53) ______

A) $\frac{1}{4}$ B) $-\frac{1}{7}$ C) 0 D) ∞

54) $\lim_{x \to \infty} \frac{2x + 1}{14x^2 - 7}$ 54) ______

A) $\frac{1}{7}$ B) $-\frac{1}{7}$ C) 0 D) ∞

55) $\lim_{x \to \infty} \frac{x^2 + 5}{x^3 + 6}$ 55) ______

A) 1 B) $\frac{5}{6}$ C) 0 D) ∞

56) $\lim_{x \to \infty} \frac{x^2}{x^2 - 14x - 5}$ 56) ______

A) 0 B) $-\frac{1}{5}$ C) 1 D) $-\frac{1}{14}$

57) $\lim_{x \to -\infty} \frac{2 + 3x^2}{x - 6x^2}$ 57) ______

A) 2 B) ∞ C) $-\infty$ D) $-\frac{1}{2}$

58) $\lim_{x \to \infty} \frac{x^2 - 3x + 18}{x^3 + 8x^2 + 7}$ 58) ______

A) $\frac{18}{7}$ B) ∞ C) 0 D) 1

59) $\lim_{x \to -\infty} \frac{-6x^2 + 3x + 14}{-10x^2 - 9x + 16}$ 59) ______

A) ∞ B) $\frac{3}{5}$ C) 1 D) $\frac{7}{8}$

60) $\lim_{x \to \infty} \frac{9 + 5x - 19x^2}{19 + 8x - 6x^2}$ 60) ______

A) 1 B) $\frac{9}{19}$ C) $\frac{19}{6}$ D) Does not exist

61) $\lim_{x \to \infty} \frac{x^3 - 3}{-9x^3 - 3x^2}$ 61) ______

A) $-\frac{1}{3}$ B) 0 C) ∞ D) $-\frac{1}{9}$

62) $\lim_{x \to -\infty} \frac{2x^3 + 3x^2}{x - 6x^2}$ 62) ______

A) $-\frac{1}{2}$ B) $-\infty$ C) ∞ D) 2

63) $\lim_{y \to -\infty} \frac{2y^3 + 1}{16y^2 + y - 7}$ 63) ______

A) $-\infty$ B) 0 C) $\frac{1}{8}$ D) ∞

64) $\lim_{x \to \infty} \frac{(9x^2 - 9)(10x + 2)}{3x^3 + 7}$ 64) ______

A) 0 B) $\frac{2}{7}$ C) 30 D) 3

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

65) $h(x) = \frac{2x - 2}{x - 3}$ 65) ______

A) $y = 0$
B) $y = 2$
C) $y = 3$
D) no horizontal asymptotes

66) $h(x) = 8 - \frac{7}{x}$ 66) ______

A) $x = 0$
B) $y = 8$
C) $y = 7$
D) no horizontal asymptotes

67) $g(x) = \frac{x^2 + 9x - 2}{x - 2}$ 67) ______

A) $y = 0$
B) $y = 2$
C) $y = 1$
D) no horizontal asymptotes

68) $h(x) = \frac{6x^2 - 3x - 4}{3x^2 - 7x + 9}$ 68) ______

A) $y = 2$
B) $y = 0$
C) $y = \frac{3}{7}$
D) no horizontal asymptotes

69) $h(x) = \frac{9x^4 - 8x^2 - 2}{8x^5 - 5x + 7}$ 69) ______

A) $y = \frac{9}{8}$
B) $y = 0$
C) $y = \frac{8}{5}$
D) no horizontal asymptotes

70) $R(x) = \frac{-3x^2 + 1}{x^2 + 2x - 8}$ 70) ______

A) $y = -4, y = 2$
B) $y = -3$
C) $y = 0$
D) no horizontal asymptotes

71) $f(x) = \dfrac{16x^4 + x^2 - 4}{x - x^3}$ 71) ______

A) $y = 0$
B) no horizontal asymptotes
C) $y = -16$
D) $y = -1$, $y = 1$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

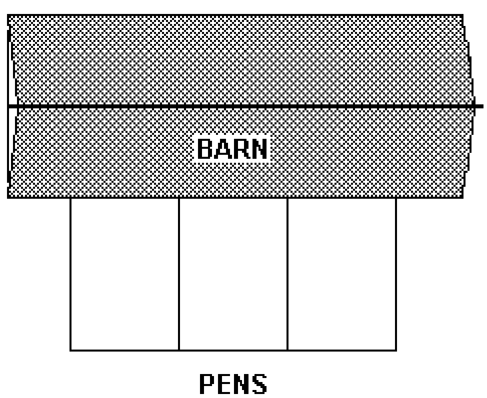
72) A carpenter is building a rectangular room with a fixed perimeter of 360 feet. What are the dimensions of the largest room that can be built? What is its area? 72) ______________

73) A carpenter is building a rectangular room with a fixed perimeter of 280 feet. What are the dimensions of the largest room that can be built? What is its area? 73) ______________

74) From a thin piece of cardboard 50 inches by 50 inches, 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. 74) ______________

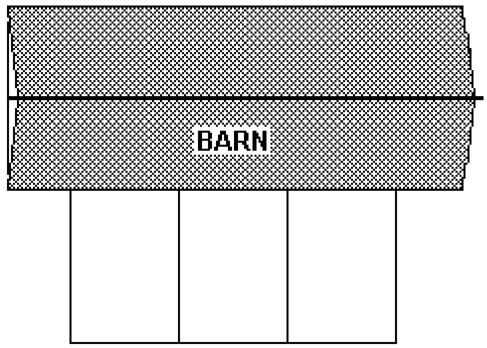
75) From a thin piece of cardboard 30 inches by 30 inches, square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? What is the maximum volume? Round to the nearest tenth, if necessary. 75) ______________

76) A farmer decides to make three identical pens with 152 feet of fence. The pens will be next to each other sharing a fence and will be up against a barn. The barn side needs no fence. 76) ______________



What dimensions for the total enclosure (rectangle including all pens) will make the area as large as possible?

77) A farmer decides to make three identical pens with 80 feet of fence. The pens will be next to each other sharing a fence and will be up against a barn. The barn side needs no fence. 77) ______________



What dimensions for the total enclosure (rectangle including all pens) will make the area as large as possible?

78) Find the number of units that must be produced and sold in order to yield the maximum profit, given the following equations for revenue and cost: 78) ______________
$R(x) = 40x - 0.5x^2$
$C(x) = 5x + 3$.

79) Find the number of units that must be produced and sold in order to yield the maximum profit, given the following equations for revenue and cost: 79) ______________
$R(x) = 7x$
$C(x) = 0.01x^2 + 1.1x + 60$.

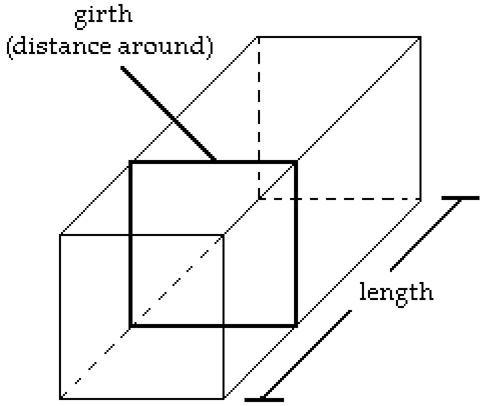
80) If the price charged for a bolt is p cents, then x thousand bolts will be sold in a certain hardware store, where $p = 124 - \frac{x}{16}$. How many bolts must be sold to maximize revenue? 80) ______________

81) The price P of a certain computer system decreases immediately after its introduction and then increases. If the price P is estimated by the formula $P = 180t^2 - 1600t + 6200$, where t is the time in months from its introduction, find the time until the minimum price is reached. 81) ______________

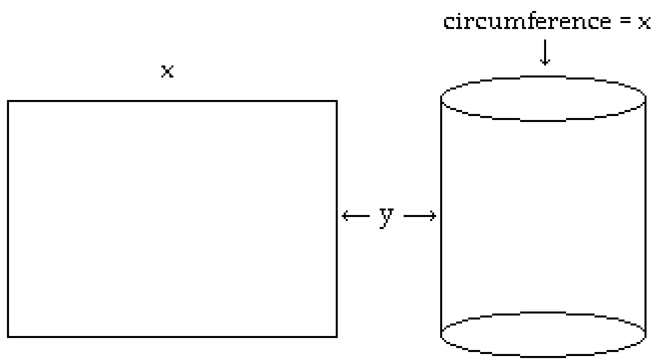
82) The price P of a certain computer system decreases immediately after its introduction and then increases. If the price P is estimated by the formula $P = 140t^2 - 1700t + 6900$, where t is the time in months from its introduction, find the time until the minimum price is reached. 82) ______________

83) The cost of a computer system increases with increased processor speeds. The cost C of a system as a function of processor speed is estimated as $C = 14S^2 - 9S + 1100$, where S is the processor speed in MHz. Find the processor speed for which cost is at a minimum. 83) ______________

84) A private shipping company will accept a box for domestic shipment only if the sum of its length and girth (distance around) does not exceed 96 inches. What dimensions will give a box with a square end the largest possible volume? 84) ______________



85) A rectangular sheet of perimeter 39 centimeters and dimensions x centimeters by y centimeters is to be rolled into a cylinder as shown in the figure. What values of x and y give the largest volume? 85) ______________



86) If the price charged for a candy bar is p(x) cents, then x thousand candy bars will be sold in a certain city, where $p(x) = 84 - \frac{x}{12}$. How many candy bars must be sold to maximize revenue? 86) ______________

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

Find the most general antiderivative.

87) $\int (3x^3 + 6x + 4)\,dx$ 87) ______

A) $3x^4 + 6x^2 + 4x + C$

B) $\frac{3}{4}x^4 + 3x^2 + 4x + C$

C) $9x^4 + 12x^2 + 4x + C$

D) $9x^2 + 6 + C$

88) $\int (5x^3 - 4x + 3)\,dx$ 88) ______

A) $15x^2 - 4 + C$

B) $\frac{5}{4}x^4 - 2x^2 + 3x + C$

C) $5x^4 - 4x^2 + 3x + C$

D) $15x^4 - 8x^2 + 3x + C$

89) $\int \left(9t^2 + \frac{t}{10}\right) dt$ 89) ______

A) $3t^3 + t + C$

B) $3t^3 + \frac{t^2}{20} + C$

C) $27t^3 + \frac{1}{5}t^2 + C$

D) $18t + \frac{1}{10} + C$

90) $\int \left(\frac{1}{x^3} - x^3 - \frac{1}{7}\right) dx$ 90) ______

A) $-3x^2 - 3x^3 + C$

B) $\frac{1}{4x^4} - \frac{x^2}{2} + \frac{1}{49} + C$

C) $\frac{1}{3x^4} - \frac{x^4}{4} - \frac{1}{7x} + C$

D) $\frac{-1}{2x^2} - \frac{x^4}{4} - \frac{x}{7} + C$

91) $\int (-4 \cos t)\,dt$ 91) ______

A) $-4 \cos t + C$

B) $-\frac{\sin t}{4} + C$

C) $-4 \sin t + C$

D) $-\frac{4}{\sin t} + C$

92) $\int (-9 \sec^2 x)\,dx$ 92) ______

A) $9 \cot x + C$

B) $\frac{\tan x}{9} + C$

C) $-9 \tan x + C$

D) $-9 \cot x + C$

93) $\int \sin\theta(\cot\theta + \csc\theta)\,d\theta$ 93) ______

A) $\sin\theta + \theta + C$

B) $\sin\theta + C$

C) $\csc\theta + \cos\theta + C$

D) $\cos\theta + C$

94) $\int (7e^{5x} - 9e^{-x})\,dx$ 94) ______

A) $\frac{7}{5}e^{5x} - 9e^{-x} + C$

B) $\frac{7}{5}e^{5x} + \frac{1}{9}e^{-x} + C$

C) $\frac{7}{5}e^{5x} + 9e^{-x} + C$

D) $\frac{5}{7}e^{5x} + 9e^{-x} + C$

95) $\int \frac{\sec\theta}{\sec\theta - \cos\theta}\, d\theta$ 95) ______

A) $\cot\theta + C$
B) $\theta + \tan\theta + C$
C) $-\cot\theta + C$
D) $\cos^2\theta + C$

96) $\int (9e^{2x} - 4e^{-x})\ dx$ 96) ______

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

97) $\int \left(\frac{7}{\sqrt{1 - x^2}} - \frac{8}{x}\right) dx$ 97) ______

A) $7\sin^{-1} x - 8 \ln |x| + C$
B) $7\sin^{-1} x + 8 \ln |x| + C$
C) $7\sin^{-1} x - \ln |x| + C$
D) $\frac{\sin^{-1} x}{7} - \frac{\ln |x|}{8} + C$

98) $\int \left(\frac{6}{x^2 + 1} - \frac{5}{x}\right) dx$ 98) ______

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

99) $\int (9e^{3x} - 8e^{-x})\ dx$ 99) ______

A) $\frac{1}{3}e^{3x} + 8e^{-x} + C$
B) $3e^{3x} + 8e^{-x} + C$
C) $3e^{3x} - 8e^{-x} + C$
D) $3e^{3x} + \frac{1}{8}e^{-x} + C$

Solve the problem.

100) 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. 100) _____

$v = -13t + 7,\ s(0) = 13$

A) $s = \frac{13}{2}t^2 + 7t - 13$
B) $s = -\frac{13}{2}t^2 + 7t + 13$
C) $s = -\frac{13}{2}t^2 + 7t - 13$
D) $s = -13t^2 + 7t + 13$

101) 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. 101) ______

$v = -9t + 9$, $s(0) = 6$

A) $s = \frac{9}{2}t^2 + 9t - 6$

B) $s = -\frac{9}{2}t^2 + 9t + 6$

C) $s = -\frac{9}{2}t^2 + 9t - 6$

D) $s = -9t^2 + 9t + 6$

Provide an appropriate response.

102) Suppose the velocity of a body moving along the s-axis is $\frac{ds}{dt} = 9.8t - 4$. 102) ______

Find the body's displacement over the time interval from $t = 2$ to $t = 7$ given that $s = s_0$ when $t=0$.

A) 184.5

B) 200.5

C) -5.3

D) Not enough information is given.

Solve the problem.

103) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 103) ______

$a = 9.8$, $v(0) = 8$, $s(0) = -6$

A) $s = 9.8t^2 + 8t - 6$

B) $s = 4.9t^2 + 8t$

C) $s = -4.9t^2 - 8t - 6$

D) $s = 4.9t^2 + 8t - 6$

104) Given the acceleration, initial velocity, and initial position of a body moving along a coordinate line at time t, find the body's position at time t. 104) ______

$a = 18$, $v(0) = 3$, $s(0) = 7$

A) $s = 9t^2 + 3t$

B) $s = 9t^2 + 3t + 7$

C) $s = -9t^2 - 3t + 7$

D) $s = 18t^2 + 3t + 7$

105) 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. 105) ______

$v = \cos\frac{\pi}{2}t$, $s(0) = 1$

A) $s = \sin t$

B) $s = \frac{2}{\pi}\sin\frac{\pi}{2}t + \pi$

C) $s = 2\pi\sin\frac{\pi}{2}t$

D) $s = \frac{2}{\pi}\sin\frac{\pi}{2}t$

1) D
2) B
3) B
4) B
5) D
6) A
7) A
8) A
9) C
10) A
11) A
12) C
13) C
14) D
15) D
16) C
17) B
18) D
19) A
20) B
21) Let $f(x) = 9x^4 + 5x^3 - 8x - 7$ and let $y_0 = 0$. $f(-1) = 5$ and $f(0) = -7$. Since f is continuous on $[-1, 0]$ and since $y_0 = 0$ is between $f(-1)$ and $f(0)$, by the Intermediate Value Theorem, there exists a c in the interval $(-1, 0)$ with the property that $f(c) = 0$. Such a c is a solution to the equation $9x^4 + 5x^3 - 8x - 7 = 0$.
22) Let $f(x) = x(x - 4)^2$ and let $y_0 = 4$. $f(3) = 3$ and $f(5) = 5$. Since f is continuous on $[3, 5]$ and since $y_0 = 4$ is between $f(3)$ and $f(5)$, by the Intermediate Value Theorem, there exists a c in the interval $(3, 5)$ with the property that $f(c) = 4$. Such a c is a solution to the equation $x(x - 4)^2 = 4$.
23) Let $f(x) = \dfrac{\sin x}{x}$ and let $y_0 = \dfrac{1}{4}$. $f\left(\dfrac{\pi}{2}\right) \approx 0.6366$ and $f(\pi) = 0$. Since f is continuous on $\left[\dfrac{\pi}{2}, \pi\right]$ and since $y_0 = \dfrac{1}{4}$ is between $f\left(\dfrac{\pi}{2}\right)$ and $f(\pi)$, by the Intermediate Value Theorem, there exists a c in the interval $\left(\dfrac{\pi}{2}, \pi\right)$, with the property that $f(c) = \dfrac{1}{4}$. Such a c is a solution to the equation $4 \sin x = x$.
24) 4
25) 2x
26) B
27) D
28) D
29) D
30) C
31) D
32) D
33) B
34) A
35) D
36) B
37) A

38) B
39) D
40) D
41) D
42) D
43) B
44) B
45) B
46) 7.01786
47) 3.0733
48) $\frac{5}{2}$
49) 4.820
50) $4\sqrt{6}$
51) C
52) A
53) A
54) C
55) C
56) C
57) D
58) C
59) B
60) C
61) D
62) C
63) A
64) C
65) B
66) B
67) D
68) A
69) B
70) B
71) B
72) 90 ft by 90 ft; 8100 ft^2
73) 70 ft by 70 ft; 4900 ft^2
74) 33.3 in. by 33.3 in. by 8.3 in.; 9259.3 $in.^3$
75) 20 in. by 20 in. by 5 in.; 2000 $in.^3$
76) 19 ft by 76 ft
77) 10 ft by 40 ft
78) 35 units
79) 295 units
80) 992 thousand bolts
81) 4.4 months
82) 6.1 months
83) 0.3 MHz
84) 16 in. by 16 in. by 32 in.

85) $x = 13$ cm; $y = \frac{13}{2}$ cm

86) 504 thousand candy bars
87) B
88) B
89) B
90) D
91) C
92) C
93) A
94) C
95) C
96) D
97) A
98) D
99) B
100) B
101) B
102) B
103) D
104) B
105) D