Review for Exam 2

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

Find the derivative of y with respect to x.

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

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

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

A) $\dfrac{6x}{\sqrt{1 - (3x^2 + 4)^2}}$ B) $\dfrac{-6x}{\sqrt{1 - (3x^2 + 4)^2}}$

C) $\dfrac{3}{\sqrt{1 + (3x^2 + 4)^2}}$ D) $\dfrac{6x}{1 + (3x^2 + 4)^2}$

3) $y = \tan^{-1} \dfrac{4x}{3}$ 3) ________

A) $\dfrac{4}{\sqrt{9 - 16x^2}}$ B) $\dfrac{12}{16x^2 + 9}$ C) $\dfrac{9}{16x^2 + 9}$ D) $\dfrac{-12}{16x^2 + 9}$

4) $y = 4x^4 \sin^{-1} x$ 4) ________

A) $\dfrac{4x^4}{\sqrt{1 - x^2}}$ B) $\dfrac{4x^4}{1 + x^2} + 16x^3 \sin^{-1} x$

C) $\dfrac{4x^4}{\sqrt{1 - x^2}} + 16x^3 \sin^{-1} x$ D) $\dfrac{1}{\sqrt{1 - x^2}} + 16x^3$

5) $y = \sec^{-1} \left(\dfrac{2x + 3}{7}\right)$ 5) ________

A) $\dfrac{-14}{1 + (2x + 3)^2}$ B) $\dfrac{14}{|2x + 3|\sqrt{(2x + 3)^2 - 49}}$

C) $\dfrac{-14}{|2x + 3|\sqrt{(2x + 3)^2 - 1}}$ D) $\dfrac{14}{\sqrt{(2x + 3)^2 - 3}}$

Use implicit differentiation to find dy/dx.

6) $x^3 = \cot y$ 6) ________

A) $-\dfrac{3x^2}{\csc y \cot y}$ B) $-\dfrac{3x^2}{\csc^2 y}$ C) $\dfrac{\csc^2 y}{3x^2}$ D) $\dfrac{3x^2}{\csc^2 y}$

7) $2xy - y^2 = 1$ 7) ________

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

8) $xy + x = 2$ 8) ________

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

9) $x = \sec(7y)$ 9) ________

A) $\frac{1}{7}\sec(7y)\tan(7y)$ B) $\cos(7y)\cot(7y)$

C) $\frac{1}{7}\cos(7y)\cot(7y)$ D) $7\sec(7y)\tan(7y)$

At the given point, find the slope of the curve , as requested.

10) $y^5 + x^3 = y^2 + 9x$, slope at (0, 1) 10) _______

A) 3 B) - 2 C) $\frac{9}{7}$ D) $\frac{9}{5}$

At the given point, find the slope of the curve, as requested.

11) $5x^2y - \pi\cos y = 6\pi$, slope at $(1, \pi)$ 11) _______

A) π B) 0 C) $-\frac{\pi}{2}$ D) -2π

At the given point, find the slope of the curve , as requested.

12) $x^6y^6 = 64$, slope at (2, 1) 12) _______

A) -32 B) $-\frac{1}{4}$ C) 2 D) $-\frac{1}{2}$

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

13) $y^4 + x^3 = y^2 + 12x$, tangent at (0, 1) 13) _______

A) $y = 6x + 1$ B) $y = 3x + 1$ C) $y = -2x$ D) $y = -3x - 1$

Find the derivative.

14) $f(x) = -5e^{11x}$ 14) _______

A) $-5xe^{-55x}$ B) $-55e^{11x}$ C) $-5e^{-55x}$ D) $-55xe^{11x}$

15) $g(x) = 2x^2e^{-x}$ 15) _______

A) $2xe^{-x}(2 - x)$ B) $2xe^{x}(2 - x)$ C) $4xe^{-x}(1 - x)$ D) $2xe^{-x}(x + 2)$

16) $f(x) = \dfrac{7e^x}{2e^x + 1}$ 16) _______

A) $\dfrac{7e^x}{(2e^x + 1)^3}$ B) $\dfrac{e^x}{(2e^x + 1)^2}$ C) $\dfrac{7e^x}{(2e^x + 1)}$ D) $\dfrac{7e^x}{(2e^x + 1)^2}$

17) $f(x) = \cos e^{-2x}$ 17) _______

A) $2 \sin e^{-2x}$ B) $-2e^{-2x} \sin e^{-2x}$ C) $2e^{-2x} \sin e^{-2x}$ D) $e^{-2x} \cos e^{-2x}$

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

18) $y = 8e^{\theta}(\sin \theta - \cos \theta)$ 18) _______

A) $16e^{\theta} \sin \theta$ B) $8e^{\theta}(\sin \theta - \cos \theta) + 8e^{\theta}$

C) 0 D) $16e^{\theta}(\sin \theta - \cos \theta)$

19) $y = \sin e^{-\theta^7}$ 19) _______

A) $\cos (-7\theta^6\, e^{-\theta^7})$ B) $7\theta^6 \cos e^{-\theta^7}$

C) $(-7\theta^6\, e^{-\theta^7}) \cos e^{-\theta^7}$ D) $\cos e^{-\theta^7}$

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

20) $f(x) = e^{7x}$, $a = 0$ 20) _______

A) $y = x + 1$ B) $y = 7x + 1$ C) $y = 7e + 1$ D) $y = 7x + 7$

21) $f(x) = 6e^{-5x}$, $a = 0$ 21) _______

A) $y = 5x - 6$ B) $y = 30x - 6$ C) $y = -30x + 6$ D) $y = 6x + 6$

22) $f(x) = 5e^{8x}$, $a = 0$ 22) _______

A) $y = 8x + 5$ B) $y = -40x + 5$ C) $y = 5x + 5$ D) $y = 40x + 5$

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

23) $y = \ln 8x$ 23) _______

A) $-\dfrac{1}{x}$ B) $-\dfrac{1}{8x}$ C) $\dfrac{1}{8x}$ D) $\dfrac{1}{x}$

24) $y = \ln(x - 7)$ 24) _______

A) $\dfrac{1}{x - 7}$ B) $\dfrac{1}{x + 7}$ C) $-\dfrac{1}{x + 7}$ D) $\dfrac{1}{7 - x}$

25) $y = \ln 2x^2$ 25) _______

A) $\dfrac{2x}{x^2 + 2}$ B) $\dfrac{1}{2x + 2}$ C) $\dfrac{2}{x}$ D) $\dfrac{4}{x}$

26) $y = \frac{\ln x}{x^7}$ 26) _______

A) $\frac{1 - 7\ln x}{x^8}$ B) $\frac{1 - 7\ln x}{x^{14}}$ C) $\frac{1 + 7\ln x}{x^{14}}$ D) $\frac{7\ln x - 1}{x^8}$

27) $y = x^7 \ln x - \frac{1}{3}x^3$ 27) _______

A) $x^7 \ln x - x^2 + 7x^6$ B) $7x^6 - x^2$

C) $8x^6 - x^2$ D) $x^6 - x^2 + 7x^6 \ln x$

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

28) $y = \ln (5\theta e^{-\theta})$ 28) _______

A) $\frac{1}{5\theta e^{\theta}}$ B) $e^{\theta}\left(\frac{1}{\theta} + 1\right)$ C) $\ln (5e^{-\theta}(1-\theta))$ D) $\frac{1}{\theta} - 1$

29) $y = \ln \left(\frac{e^{\theta}}{4 + e^{\theta}}\right)$ 29) _______

A) $\frac{4 + 2e^{\theta}}{4 + e^{\theta}}$ B) $\frac{4}{4 + e^{\theta}}$ C) $\frac{4 + e^{\theta}}{e^{\theta}}$ D) $\ln \left(\frac{4}{4 + e^{\theta}}\right)$

Find the derivative of y with respect to the independent variable.

30) $y = 5^x$ 30) _______

A) $x \ln 5$ B) 5^x C) $5^x \ln x$ D) $5^x \ln 5$

31) $y = 10^x$ 31) _______

A) $10^x \ln x$ B) $10^x \ln 10$ C) $x \ln 10$ D) 10^x

Find the derivative of the function.

32) $y = \log (2x)$ 32) _______

A) $\frac{1}{x(\ln 2)}$ B) $\frac{1}{x(\ln 10)}$ C) $\frac{1}{\ln 10}$ D) $\frac{1}{x}$

33) $y = \log (7x)$ 33) _______

A) $\frac{1}{x}$ B) $\frac{1}{x(\ln 10)}$ C) $\frac{1}{\ln 10}$ D) $\frac{1}{x(\ln 7)}$

34) $y = \log (6x - 1)$ 34) _______

A) $\frac{6x - 1}{6 \ln 10}$ B) $\frac{1}{\ln 10 (6x - 1)}$ C) $\frac{6}{\ln 10 (6x - 1)}$ D) $\frac{6}{\ln 10}$

Find the derivative of y with respect to the independent variable.

35) $y = 3^{\ln 4t}$ 35) _______

A) $3^{\ln 4t}$ B) $\frac{\ln 3}{t} 3^{\ln 4t}$ C) $\frac{4 \ln 3}{t} 3^{\ln 4t}$ D) $\frac{4 \ln 3}{t}$

Find the derivative of the function.

36) $y = \log_5 (4x)$ 36) _______

A) $\frac{\ln 5}{x}$ B) $\frac{4}{x \ln 5}$ C) $\frac{1}{x \ln 5}$ D) $\frac{1}{x}$

37) $f(x) = \log_7 (x^3 + 1)$ 37) _______

A) $\frac{3x^2}{(x^3 + 1)}$ B) $\frac{3(\ln 7)\, x^2}{(x^3 + 1)}$

C) $\frac{3x^2}{(\ln 7)(x^3 + 1)}$ D) $\frac{1}{(\ln 7)(x^3 + 1)} + 3x^2$

Solve the problem.

38) Suppose that the radius r and volume $V = \frac{4}{3}\pi r^3$ of a sphere are differentiable functions of t. 38) _______

Write an equation that relates dV/dt to dr/dt.

A) $\frac{dV}{dt} = 3r^2 \frac{dr}{dt}$ B) $\frac{dV}{dt} = 4\pi \frac{dr}{dt}$

C) $\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$ D) $\frac{dV}{dt} = \frac{4}{3}\pi r^2 \frac{dr}{dt}$

Solve the problem. Round your answer, if appropriate.

39) A spherical balloon is inflated with helium at a rate of 130π ft^3/min. How fast is the balloon's radius increasing when the radius is 8 ft? 39) _______

A) 0.06 ft/min B) 2.03 ft/min C) 1.52 ft/min D) 0.51 ft/min

40) A ladder is slipping down a vertical wall. If the ladder is 10 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 8 ft from the wall? 40) _______

A) 0.8 ft/s B) 0.25 ft/s C) 2.5 ft/s D) 1.5 ft/s

41) A man flies a kite at a height of 50 m. The wind carries the kite horizontally away from him at a rate of 10 m/sec. How fast is the distance between the man and the kite changing when the kite is 130 m away from him? 41) _______

A) 10.9 m/sec B) 10 m/sec C) 9.3 m/sec D) 51 m/sec

Solve the problem.

42) Water is falling on a surface, wetting a circular area that is expanding at a rate of 10 mm^2/s. How fast is the radius of the wetted area expanding when the radius is 131 mm? (Round your answer to four decimal places.) 42) _______

A) 0.0121 mm/s B) 82.3097 mm/s C) 0.0243 mm/s D) 0.0763 mm/s

43) Assume that the profit generated by a product is given by $P(x) = 4\sqrt{x}$, where x is the number of units sold. If the profit keeps changing at a rate of \$300 per month, then how fast are the sales changing when the number of units sold is 1700? (Round your answer to the nearest dollar per month.) 43) _______

A) \$98,955/month
B) \$3092/month
C) \$6185/month
D) \$4/month

Solve the problem. Round your answer, if appropriate.

44) One airplane is approaching an airport from the north at 168 km/hr. A second airplane approaches from the east at 250 km/hr. Find the rate at which the distance between the planes changes when the southbound plane is 26 km away from the airport and the westbound plane is 19 km from the airport. 44) _______

A) −424 km/hr
B) −141 km/hr
C) −566 km/hr
D) −283 km/hr

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

45) $f(x) = 5x^2 + 5x - 3$, $a = 3$ 45) _______

A) $L(x) = 35x + 42$
B) $L(x) = 25x - 48$
C) $L(x) = 25x + 42$
D) $L(x) = 35x - 48$

46) $f(x) = \sqrt[3]{x}$, $a = 8$ 46) _______

A) $L(x) = \frac{1}{12}x + \frac{2}{3}$
B) $L(x) = \frac{1}{4}x + 4$
C) $L(x) = \frac{1}{4}x + \frac{2}{3}$
D) $L(x) = \frac{1}{12}x + \frac{4}{3}$

47) $f(x) = \sqrt{8x + 9}$, $a = 0$ 47) _______

A) $L(x) = \frac{4}{3}x - 3$
B) $L(x) = \frac{4}{3}x + 3$
C) $L(x) = \frac{8}{3}x + 3$
D) $L(x) = \frac{8}{3}x - 3$

48) $f(x) = \tan x$, $a = \pi$ 48) _______

A) $L(x) = x - 2\pi$
B) $L(x) = x + \pi$
C) $L(x) = 2x - \pi$
D) $L(x) = x - \pi$

Use Linear Approximation to calculate the given number.

49) $\sqrt{81.25}$ 49) _______

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

A) 7.87500
B) 9.01389
C) 11.25000
D) 10.12500

50) $\sqrt{8.03}$ 50) _______

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

A) 2.6767
B) 2.8383
C) 3.1617
D) 2.0300

51) $\sqrt[3]{1.003}$ 51) _______

Give your answer as a decimal.

A) 1.003
B) 1.01
C) 2.001
D) 1.001

Solve the problem.

52) $A = \pi r^2$, where r is the radius, in centimeters. By approximately how much does the area of a circle decrease when the radius is decreased from 2.0 cm to 1.9 cm? (Use 3.14 for π.) 52) _______

A) 1.3 cm^2 B) 1.5 cm^2 C) 1.1 cm^2 D) 0.6 cm^2

53) $V = \frac{4}{3}\pi r^3$, where r is the radius, in centimeters. By approximately how much does the volume of a sphere increase when the radius is increased from 3.0 cm to 3.1 cm? (Use 3.14 for π.) 53) _______

A) 11.1 cm^3 B) 11.5 cm^3 C) 0.4 cm^3 D) 11.3 cm^3

Determine all critical points for the function.

54) $f(x) = x^2 + 6x + 9$ 54) _______

A) $x = -3$ B) $x = 3$ C) $x = 0$ D) $x = -6$

55) $f(x) = x^3 - 12x - 3$ 55) _______

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

56) $f(x) = x^3 - 3x^2 + 7$ 56) _______

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

57) $f(x) = 80x^3 - 3x^5$ 57) _______

A) $x = 4$
B) $x = -4$
C) $x = -4$ and $x = 4$
D) $x = 0$, $x = -4$, and $x = 4$

58) $f(x) = (x - 9)^3$ 58) _______

A) $x = 0$, $x = 9$, and $x = 3$
B) $x = 9$
C) $x = 9$ and $x = 3$
D) $x = 0$ and $x = 9$

59) $y = 4x^2 - 128\sqrt{x}$ 59) _______

A) $x = 0$, $x = 4$, and $x = -4$
B) $x = 0$ and $x = 4$
C) $x = 4$
D) $x = 0$

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

60) $f(x) = x^2 + 10x + 25$; $I = [-10, 0]$ 60) _______

A) Critical points: -10, 0, 5; maximum value 25; minimum value 0
B) Critical points: -10, -5, 0; maximum value 25; minimum value 0
C) Critical points: -10, 0, 25; minimum value 0
D) Critical points: -5; maximum value 10; minimum value 0

61) $f(x) = x^3 - 12x - 4$; $I = [-3, 5]$ 61) _______

A) Critical points: -2, 2; no maximum value; minimum value -20
B) Critical points: -3, -2, 2, 5; maximum value 61; minimum value -20
C) Critical points: -2, 2; maximum value 12; minimum value -20
D) Critical points: -3, -2, 2, 5; maximum value 61; minimum value 5

62) $f(r) = \frac{1}{r^2 + 2}$; I =[-1, 4] 62) _______

A) Critical points: -1, 4; maximum value $\frac{1}{3}$; minimum value $\frac{1}{18}$

B) Critical points: 0; maximum value $\frac{1}{2}$; minimum value 0

C) Critical points: -1, 0, 4; maximum value $\frac{1}{2}$; minimum value $\frac{1}{18}$

D) Critical points: -1, 0, 4; maximum value $\frac{1}{2}$; minimum value $\frac{1}{3}$

63) $g(t) = t^{2/3}$; I = [-1, 8] 63) _______

A) Critical points: -1, 0, 8; maximum value 4; minimum value 0
B) Critical points: -1, 0, 8; maximum value 1; minimum value 0
C) Critical points: -1, 8; maximum value 4; minimum value 3
D) Critical points: 0; no maximum value; minimum value 0

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

64) $f(x) = x^2 + 3x + 4$, [2, 3] 64) _______

A) $\frac{5}{2}$ B) 2, 3 C) $-\frac{5}{2}, \frac{5}{2}$ D) 0, $\frac{5}{2}$

65) $f(x) = \ln(x - 3)$, [4, 7] Round to the nearest thousandth. 65) _______

A) 5.164 B) 5.731 C) 6.164 D) ±5.164

66) $f(x) = x^2 + 4x + 2$, [2, 3] 66) _______

A) 0, $\frac{5}{2}$ B) $-\frac{5}{2}, \frac{5}{2}$ C) 2, 3 D) $\frac{5}{2}$

67) $f(x) = x + \frac{27}{x}$, [3, 9] 67) _______

A) 3, 9 B) 0, $3\sqrt{3}$ C) $3\sqrt{3}$ D) $-3\sqrt{3}, 3\sqrt{3}$

68) $f(x) = \ln(x - 2)$, [3, 5] Round to the nearest thousandth. 68) _______

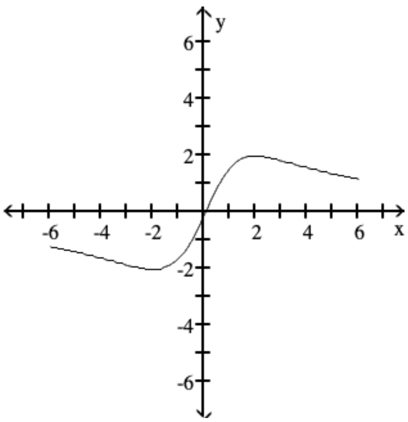
A) 3.820 B) ±3.820 C) 4.820 D) 4.885

69) $f(x) = x^2 + 2x + 3$, [1, 2] 69) _______

A) $\frac{3}{2}$ B) $-\frac{3}{2}, \frac{3}{2}$ C) 1, 2 D) 0, $\frac{3}{2}$

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.

70) 70) _______



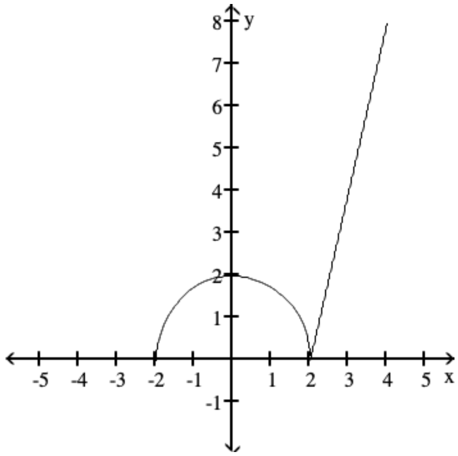
A) increasing on (−2, 2); decreasing on (0, 6);
absolute maximum at (2, 2); absolute minimum at (−2, −2)

B) increasing on (−2, 2); decreasing on (−6, −2) and (2, 6);
absolute maximum at (2, 2); absolute minimum at (−2, −2)

C) increasing on (−2, 2); decreasing on (−6, −2) and (2, 6);
no absolute maximum; no absolute minimum

D) increasing on (−2, 2); decreasing on (−6, 0);
absolute maximum at (2, 2); absolute minimum at (−2, −2)

71) 71) _______



A) increasing on (2, 4); decreasing on (0, 2);
absolute maximum at (4, 8); local maximum at (0, 2); absolute minimum at (–2, 0) and (2, 0)

B) increasing on (–2, 0) and (2, 4); decreasing on (0, 2);
absolute maximum at (4, 8); 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, 8) 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, 8); absolute minimum at (–2, 0) and (2, 0)

Find the largest open interval where the function is changing as requested.

72) Increasing $f(x) = x^2 - 2x + 1$ 72) _______

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

73) Increasing $y = (x^2 - 9)^2$ 73) _______

A) $(3, \infty)$ B) $(-3, 3)$ C) $(-\infty, 0)$ D) $(-3, 0)$

74) Increasing $f(x) = \dfrac{1}{x^2 + 1}$ 74) _______

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

Using the sign of the Derivative find where the function is increasing and where it is decreasing.

75) $g(x) = x^2 - 2x + 1$ 75) _______

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

76) $f(x) = \frac{1}{4}x^2 - \frac{1}{2}x$ 76) _______

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

77) $h(t) = \frac{1}{t^2 + 1}$ 77) _______

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

78) $h(z) = 48z - z^3$ 78) _______
A) Increasing on $(-\infty, -4] \cup [4, \infty)$, decreasing on [-4, 4]
B) Increasing on [-4, 4], decreasing on $(-\infty, -4] \cup [4, \infty)$
C) Increasing on $(-\infty, 4]$, decreasing on $[4, \infty)$
D) Increasing on [-16, 16], decreasing on $(-\infty, -16] \cup [16, \infty)$

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

79) $y = x^2 + 2x - 3$ 79) _______
A) Absolute minimum is –4 at x = –1.
B) Absolute minimum is –1 at x = 4.
C) Absolute minimum is 1 at x = 4.
D) Absolute minimum is 1 at x = –4.

80) $y = x^3 - 12x + 2$ 80) _______
A) Local maximum at (0, 0).
B) None
C) Local maximum at (2, –14), local minimum at (–2, 18).
D) Local maximum at (–2, 18), local minimum at (2, –14).

81) $y = \frac{1}{x^2 + 1}$ 81) _______

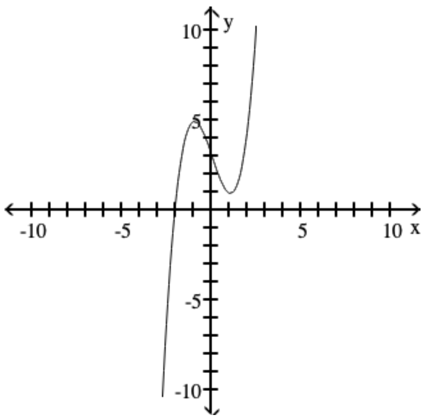
A) Absolute minimum value is –1 at x = 0.5.
B) Absolute maximum value is 1 at x = 0.5.
C) Absolute maximum value is 1 at x = 0.5, absolute minimum value is –1 at x = 0.5.
D) Absolute maximum value is 1 at x = 0.

82) $y = (x + 4)^{2/3}$ 82) _______
A) Absolute minimum value is 0 at x = –4.
B) There are no definable extrema.
C) Absolute minimum value is 0 at x = 4.
D) Absolute maximum value is 0 at x = 4.

83) $y = x^3 - 3x^2 + 4x - 4$ 83) _______
A) Absolute maximum is 0 at x = 1.
B) None
C) Absolute minimum is 0 at x = –1.
D) Absolute maximum is 0 at x = 2.

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.

84) 84) _______



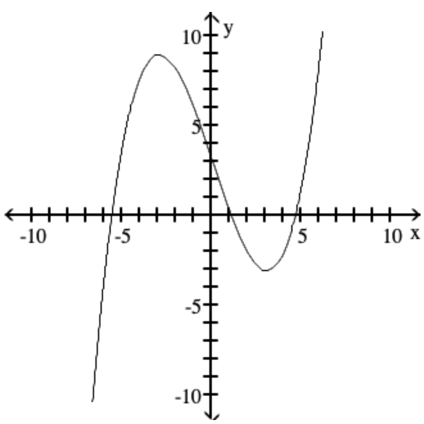
A) Local minimum at $x = 1$; local maximum at $x = -1$; concave up on $(0, \infty)$; concave down on $(-\infty, 0)$

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

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

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

85) 85) _______



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

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

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.

86) $f(x) = x^2 - 12x + 37$ 86) _______

A) Concave up on $(-\infty, 6)$, concave down on $(6, \infty)$

B) Concave up for all x

C) Concave up on $(6, \infty)$, concave down on $(-\infty, 6)$

D) Concave down for all x

87) $q(x) = 4x^3 + 2x + 8$ 87) _______

A) Concave up for all x
B) Concave down for all x
C) Concave up on $(0, \infty)$, concave down on $(-\infty, 0)$
D) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$

88) $f(x) = 4x - x^3$ 88) _______

A) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$
B) Concave down for all t
C) Concave up on $(0, \infty)$, concave down on $(-\infty, 0)$
D) Concave up on $(-\infty, 0)$ and $(1, \infty)$, concave down on $(0, 1)$

89) $f(x) = x^3 + 12x^2 - x - 24$ 89) _______

A) Concave down on $(-\infty, -4)$ and $(4, \infty)$, concave up on $(-4, 4)$
B) Concave up on $(-\infty, -4)$, concave down on $(-4, \infty)$
C) Concave down for all x
D) Concave up on $(-4, \infty)$, concave down on $(-\infty, -4)$

90) $f(x) = -x^3 + 6x + 1$ 90) _______

A) Concave down on $(-\infty, 0)$, concave up on $(0, \infty)$
B) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$
C) Concave up on $(-\infty, 1)$, concave down on $(1, \infty)$
D) Concave down on $(-\infty, 1)$, concave up on $(1, \infty)$

91) $f(x) = x^3 - 12x^2 + 2x + 15$ 91) _______

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

92) $f(x) = x^2 - 2x + 4$ 92) _______

A) Concave up on $(1, \infty)$, concave down on $(-\infty, 1)$; inflection point (1, 3)
B) Concave up on $(-\infty, 1)$, concave down on $(1, \infty)$; inflection point (1, 3)
C) Concave down for all x; no inflection points
D) Concave up for all x; no inflection points

93) $q(x) = 2x^3 + 2x + 8$ 93) _______

A) Concave up for all x; no inflection points
B) Concave up on $(0, \infty)$, concave down on $(-\infty, 0)$; inflection point (0, 8)
C) Concave down for all x; no inflection points
D) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$; inflection point (0, 8)

94) $T(t) = 8t - t^3$ 94) _______

A) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$; inflection point $(0, 0)$
B) Concave up on $(0, \infty)$, concave down on $(-\infty, 0)$; inflection point $(0, 0)$
C) Concave down for all t, no points of inflection
D) Concave up on $(-\infty, 0) \cup (1, \infty)$, concave down on $(0, 1)$; inflection points $(0, 0)$, $(1, 8)$

95) $f(x) = x^3 + 3x^2 - x - 24$ 95) _______

A) Concave up on $(-\infty, -1)$, concave down on $(-1, \infty)$; inflection point $(-1, -21)$
B) Concave up on $(-1, \infty)$, concave down on $(-\infty, -1)$; inflection point $(-1, -21)$
C) Concave down for all x; no inflection points
D) Concave down on $(-\infty, -1) \cup (1, \infty)$, concave up on $(-1, 1)$; inflection points $(-1, -21)$, $(1, -21)$

96) $G(x) = \frac{1}{4}x^4 - x^3 + 12$ 96) _______

A) Concave up on $(-\infty, 0) \cup (2, \infty)$, concave down on $(0, 2)$; inflection points $(0, 12)$ and $(2, 8)$
B) Concave up for $(-\infty, 0)$, concave down for $(0, \infty)$; inflection point $(0, 12)$
C) Concave up for $(2, \infty)$, concave down on $(-\infty, 2)$; inflection point $(2, 8)$
D) Concave up on $(0, 2)$, concave down on $(-\infty, 0) \cup (2, \infty)$; inflection points $(0, 12)$ and $(2, 8)$

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

50) B
51) D
52) A
53) D
54) A
55) A
56) C
57) D
58) B
59) B
60) B
61) B
62) C
63) A
64) A
65) A
66) D
67) C
68) A
69) A
70) B
71) B
72) C
73) A
74) B
75) C
76) D
77) A
78) B
79) A
80) D
81) D
82) A
83) B
84) A
85) A
86) B
87) C
88) A
89) D
90) B
91) B
92) D
93) B
94) A
95) B
96) A