Practice Exam 2, Math 1190.001(Bus.Cal)

Date: .....

Name (L/F) : _____ **Student ID (EUID) # .....**

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

Find all values of x (if any) where the tangent line to the graph of the function is horizontal.

1) $y = x^3 - 12x + 2$ 1) _____

A) –2, 0, 2 B) 2, –2 C) 0, 2 D) 0

Differentiate.

2) $f(x) = (2x^3 + 7)(4x^7 - 7)$ 2) _____

A) $f'(x) = 80x^9 + 196x^6 - 42x$ B) $f'(x) = 8x^9 + 196x^6 - 42x$

C) $f'(x) = 80x^9 + 196x^6 - 42x^2$ D) $f'(x) = 8x^9 + 196x^6 - 42x^2$

3) $g(x) = (x^{-5} + 3)(x^{-3} + 5)$ 3) _____

A) $g'(x) = -8x^{-9} - 25x^{-4} - 9x^{-4}$ B) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-4}$

C) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-2}$ D) $g'(x) = -8x^{-7} - 25x^{-6} - 9x^{-4}$

4) $y = \dfrac{3x - 5}{5x^2 + 1}$ 4) _____

A) $\dfrac{dy}{dx} = \dfrac{15x^3 - 30x^2 + 53x}{(5x^2 + 1)^2}$ B) $\dfrac{dy}{dx} = \dfrac{-15x^2 + 47x + 8}{(5x^2 + 1)^2}$

C) $\dfrac{dy}{dx} = \dfrac{-15x^2 + 50x + 3}{(5x^2 + 1)^2}$ D) $\dfrac{dy}{dx} = \dfrac{45x^2 - 50x + 3}{(5x^2 + 1)^2}$

5) $y = \dfrac{x^2 + 2x - 2}{x^2 - 2x + 2}$ 5) _____

A) $\dfrac{dy}{dx} = \dfrac{-4x^2 - 8x}{(x^2 - 2x + 2)^2}$ B) $\dfrac{dy}{dx} = \dfrac{4x^2 - 8x}{(x^2 - 2x + 2)^2}$

C) $\dfrac{dy}{dx} = \dfrac{-4x^2 + 8x}{(x^2 - 2x + 2)^2}$ D) $\dfrac{dy}{dx} = \dfrac{4x^2 + 8x}{(x^2 - 2x + 2)^2}$

6) $f(x) = (4x^2 + 7)^3 - (1 + 4x^3)^5$ 6) _____

A) $f'(x) = 24x(4x^2 + 7)^2 - 60x^2(1 + 4x^3)^4$

B) $f'(x) = 24x(4x^2 + 7)^2 - 12x^2(1 + 4x^3)^4$

C) $f'(x) = (24x + 7)(4x^2 + 7)^2 - (1 + 60x^2)(1 + 4x^3)^4$

D) $f'(x) = 3(4x^2 + 7)^2 - 5(1 + 4x^3)^4$

7) $f(x) = \left(\frac{1 + 3x}{3x}\right)(3 - x)$ 7) _____

A) $f'(x) = \frac{1}{x^2} + 1$ B) $f'(x) = \frac{1}{x^2} + 3$ C) $f'(x) = x^2 - 1$ D) $f'(x) = -\frac{1}{x^2} - 1$

8) $f(x) = \frac{x}{-5 + x^{-1}}$ 8) _____

A) $f'(x) = \frac{-5x^2 + 2x}{(-5x + 1)^2}$

B) $f'(x) = -x^2$

C) $f'(x) = \frac{1}{(-5 + x^{-1})^2}$

D) $f'(x) = \frac{-5x^2}{(-5x + 1)^2}$

9) $g(x) = \frac{x^2 + 5}{x^2 + 6x}$ 9) _____

A) $g'(x) = \frac{6x^2 - 10x - 30}{x^2(x + 6)^2}$

B) $g'(x) = \frac{x^4 + 6x^3 + 5x^2 + 30x}{x^2(x + 6)^2}$

C) $g'(x) = \frac{2x^3 - 5x^2 - 30x}{x^2(x + 6)^2}$

D) $g'(x) = \frac{4x^3 + 18x^2 + 10x + 30}{x^2(x + 6)^2}$

10) $g(x) = \frac{x^2}{x - 11}$ 10) _____

A) $g'(x) = \frac{x^2}{(x - 11)^2}$

B) $g'(x) = \frac{x^2 + 22x}{(x - 11)^2}$

C) $g'(x) = \frac{x^2 - 22x}{(x - 11)^2}$

D) $g'(x) = \frac{22x}{(x - 11)^2}$

11) $f(x) = (5x - 5)(\sqrt{x} + 3)$ 11) _____

A) $f'(x) = 7.5x^{1/2} - 2.5x^{-1/2} + 15$

B) $f'(x) = 3.33x^{1/2} - 2.5x^{-1/2} + 15$

C) $f'(x) = 3.33x^{1/2} - 5x^{-1/2} + 15$

D) $f'(x) = 7.5x^{1/2} - 5x^{-1/2} + 15$

12) $g(x) = (x^{-5} + 3)(x^{-3} + 5)$ 12) _____

A) $g'(x) = -8x^{-9} - 25x^{-4} - 9x^{-4}$

B) $g'(x) = -8x^{-7} - 25x^{-6} - 9x^{-4}$

C) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-2}$

D) $g'(x) = -8x^{-9} - 25x^{-6} - 9x^{-4}$

13) $f(x) = (5x^3 + 5)(2x^7 - 6)$ 13) _____

A) $f'(x) = 20x^9 + 70x^6 - 90x^2$

B) $f'(x) = 100x^9 + 70x^6 - 90x$

C) $f'(x) = 100x^9 + 70x^6 - 90x^2$

D) $f'(x) = 20x^9 + 70x^6 - 90x$

14) $f(x) = (3x^4 + 8)^2$ 14) _____

A) $f'(x) = 6x^4 + 16$

B) $f'(x) = 144x^{15} + 96x^3$

C) $f'(x) = 9x^{16} + 64$

D) $f'(x) = 72x^7 + 192x^3$

Find the derivative.

15) $y = \sqrt{x}(3x - 5) + 15x - 25$ 15) _____

A) $2x^{1/2} - 2.5x^{-1/2} + 15$

B) $2x^{1/2} - 5x^{-1/2} + 15$

C) $4.5x^{1/2} - 5x^{-1/2} + 15$

D) $4.5x^{1/2} - 2.5x^{-1/2} + 15$

16) $y = \dfrac{x^2 - 4}{x}$ 16) _____

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

17) $y = \dfrac{x^2 + 8x + 3}{\sqrt{x}}$ 17) _____

A) $\dfrac{3x^2 + 8x - 3}{x}$ B) $\dfrac{3x^2 + 8x - 3}{2x^{3/2}}$ C) $\dfrac{2x + 8}{2x^{3/2}}$ D) $\dfrac{2x + 8}{x}$

18) $y = -8\sqrt{x}$ 18) _____

A) $\dfrac{dy}{dx} = -\dfrac{4}{\sqrt{x}}$ B) $\dfrac{dy}{dx} = \dfrac{4}{\sqrt{x}}$ C) $\dfrac{dy}{dx} = -\dfrac{8}{\sqrt{x}}$ D) $\dfrac{dy}{dx} = 4\sqrt{x}$

19) $y = \sqrt[6]{x^5}$ 19) _____

A) $\dfrac{dy}{dx} = \dfrac{6\sqrt[5]{x}}{5}$ B) $\dfrac{dy}{dx} = \dfrac{5}{6\sqrt[6]{x}}$ C) $\dfrac{dy}{dx} = \dfrac{1}{\sqrt[6]{x}}$ D) $\dfrac{dy}{dx} = \dfrac{5\sqrt[6]{x}}{6}$

20) $y = \dfrac{8}{x} - \dfrac{x}{8}$ 20) _____

A) $\dfrac{dy}{dx} = -8x - \dfrac{1}{8}$ B) $\dfrac{dy}{dx} = -\dfrac{8}{x^2} - \dfrac{1}{8}$ C) $\dfrac{dy}{dx} = -\dfrac{8}{x^2} + \dfrac{x}{8}$ D) $\dfrac{dy}{dx} = \dfrac{8}{x^2} - \dfrac{1}{8}$

21) $f(x) = 9x^{7/5} - 5x^2 + 10^4$ 21) _____

A) $f'(x) = \dfrac{63}{5}x^{2/5} - 10x$

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

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

D) $f'(x) = \dfrac{63}{5}x^{6/5} - 10x$

22) $f(x) = 7\sqrt{x} + \sqrt[3]{x} - 2\sqrt[4]{x} + 2\sqrt[5]{x}$ 22) _____

A) $f'(x) = \frac{1}{2}x^{-1/2} + \frac{1}{3}x^{-2/3} + \frac{1}{4}x^{-3/4} + \frac{1}{5}x^{-4/5}$

B) $f'(x) = \frac{7}{2}x^{-1/2} + \frac{1}{3}x^{2/3} - \frac{1}{2}x^{3/4} + \frac{2}{5}x^{-4/5}$

C) $f'(x) = \frac{7}{2}x^{-1/2} + \frac{1}{3}x^{-2/3} - \frac{1}{2}x^{-3/4} + \frac{2}{5}x^{-4/5}$

D) $f'(x) = \frac{7}{2}x^{1/2} + \frac{1}{3}x^{2/3} - \frac{1}{2}x^{3/4} + \frac{2}{5}x^{4/5}$

23) $f(x) = \frac{4}{\sqrt{x}} - \frac{3}{x} + \frac{9}{x^4}$ 23) _____

A) $f'(x) = -\frac{2}{x^{3/2}} + \frac{3}{x^2} - \frac{36}{x^5}$

B) $f'(x) = -\frac{2}{x^{3/2}} - \frac{3}{x^2} - \frac{36}{x^3}$

C) $f'(x) = -2\sqrt{x} + \frac{3}{x^2} - \frac{36}{x^3}$

D) $f'(x) = \frac{2}{x^{1/2}} - \frac{3}{x^2} - \frac{36}{x^5}$

24) $y = \frac{1}{2}x^6 - \frac{1}{5}x^5$ 24) _____

A) $\frac{dy}{dx} = 3x^6 - x^5$

B) $\frac{dy}{dx} = 3x^7 - x^6$

C) $\frac{dy}{dx} = \frac{1}{2}x^5 - \frac{1}{5}x^4$

D) $\frac{dy}{dx} = 3x^5 - x^4$

Differentiate.

25) $f(x) = \frac{(x + 4)(x + 2)}{(x - 4)(x - 2)}$ 25) _____

A) $f'(x) = \frac{12x^2 - 96}{(x - 4)^2(x - 2)^2}$

B) $f'(x) = \frac{-12x^2 + 96}{(x - 4)^2(x - 2)^2}$

C) $f'(x) = \frac{-x^2 + 16}{(x - 4)^2(x - 2)^2}$

D) $f'(x) = \frac{12x - 96}{(x - 4)^2(x - 2)^2}$

26) $f(x) = (-5x - 2)^4$ 26) _____

A) $f'(x) = 4(-5x - 2)^3$

B) $f'(x) = -20(-5x - 2)^3$

C) $f'(x) = -20(-5x - 2)^4$

D) $f'(x) = -5(-5x - 2)^3$

27) $h(z) = \sqrt[4]{\frac{3z + 7}{-8z + 1}}$ 27) _____

A) $h'(z) = \frac{59(3z + 7)^{-3/4}}{4(1 - 8z)^2(1 - 8z)^{-3/4}}$

B) $h'(z) = -\frac{3(3z + 7)^{-3/4}}{32(1 - 8z)^{-3/4}}$

C) $h'(z) = \frac{59(3z + 7)^{-3/4}}{(1 - 8z)^2(1 - 8z)^{-3/4}}$

D) $h'(z) = \frac{(3z + 7)^{-3/4}}{4(1 - 8z)^{-3/4}}$

Determine where the given function is increasing and where it is decreasing.

28) $s(x) = -x^2 - 10x + 11$ 28) _____

A) Increasing on $(-\infty, -5]$, decreasing on $[-5, \infty)$
B) Increasing on $(-\infty, \infty)$
C) Decreasing on $(-\infty, -5]$ and $[0, \infty)$, increasing on $[-5, 0]$
D) Decreasing on $(-\infty, -5]$, increasing on $[-5, \infty)$

29) $f(x) = -5x^2 - 2x - 3$ 29) _____

A) Increasing on $\left(-\infty, -\frac{1}{5}\right]$ and $(0, \infty)$, decreasing on $\left[-\frac{1}{5}, 0\right]$
B) Increasing on $\left(-\infty, \frac{1}{5}\right]$, decreasing on $\left[\frac{1}{5}, \infty\right)$
C) Increasing on $\left(-\infty, -\frac{1}{5}\right]$, decreasing on $\left[-\frac{1}{5}, \infty\right)$
D) Decreasing on $\left(-\infty, -\frac{1}{5}\right]$, increasing on $\left[-\frac{1}{5}, \infty\right)$

30) $f(x) = x^3 - 12x + 2$ 30) _____

A) Decreasing on $(-\infty, -2]$ and $[2, \infty)$, increasing on $[-2, 2]$
B) Increasing on $(-\infty, -2]$ and $[2, \infty)$, decreasing on $[-2, 2]$
C) Decreasing on $(-\infty, -2]$, increasing on $[-2, \infty)$
D) Increasing on $(-\infty, -4]$ and $[4, \infty)$, decreasing on $[-4, 4]$

Find the relative extrema of the function and classify each as a maximum or minimum.

31) $f(x) = 4x^2 - 24x + 31$ 31) _____

A) Relative minimum: $(-5, 3)$
B) Relative maximum: $(-3, 5)$
C) Relative minimum: $(3, -5)$
D) Relative minimum: $(5, -3)$

32) $f(x) = x^4 - 8x^2 + 2$ 32) _____

A) Relative maximum: $(0, 2)$; relative minimum: $(2, -14)$
B) Relative minimum: $(0, 2)$; relative maxima: $(2, -14)$, $(-2, -18)$
C) Relative maximum: $(0, 2)$; relative minima: $(2, -14)$, $(-2, -14)$
D) Relative maximum: $(2, -14)$; relative minimum: $(-2, -14)$

33) $f(x) = x^2(2 - x)^2$ 33) _____

A) Relative minimum: $(0,0)$, relative maximum: $(1, 1)$, relative minimum: $(2, 0)$
B) Relative minimum: $(0,0)$, relative minimum: $(2, 0)$
C) Relative maximum: $(0,0)$, relative minimum: $(1, 1)$, relative maximum: $(2, 0)$
D) Relative maximum: $(0,0)$, relative minimum: $(1, 1)$

34) $s(x) = -x^2 - 22x - 72$ 34) _____

A) Relative maximum: $(-11, 49)$
B) Relative minimum: $(22, -72)$
C) Relative maximum: $(-22, -72)$
D) Relative maximum: $(11, 49)$

35) $y = x^3 - 3x^2 + 4x - 4$ 35) _____

A) Relative minimum: $(1, 0)$
B) Relative maximum: $(2, 0)$
C) Relative maximum: $(-1, 0)$
D) No relative extrema exist

36) $f(x) = -x^3 + 9x^2 - 2$ 36) _____

A) Relative minimum: (0, −2)

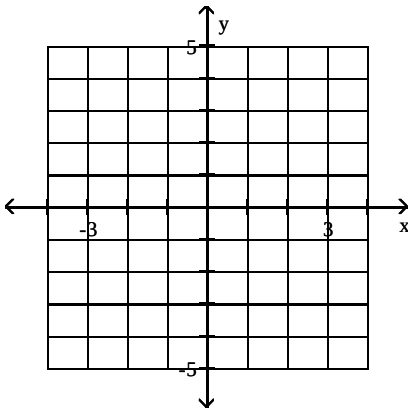
B) Relative minimum: (0, −2); relative maximum: (6, 106)

C) Relative maximum: (−3, 110); relative minimum: (3, −52)

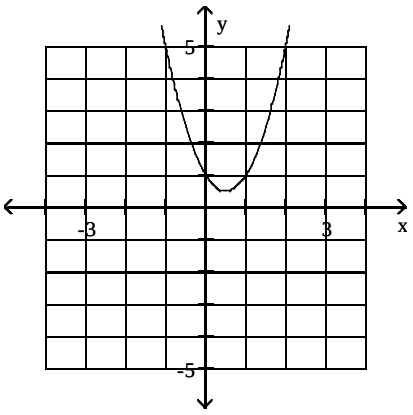
D) Relative maximum: (0, −2); relative minimum: (6, 106)

Graph the function by first finding the relative extrema.

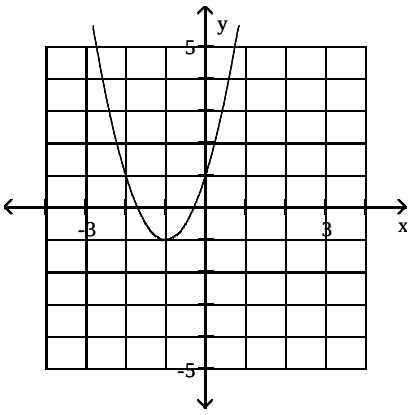
37) $f(x) = 2x^2 + 4x + 1$ 37) _____



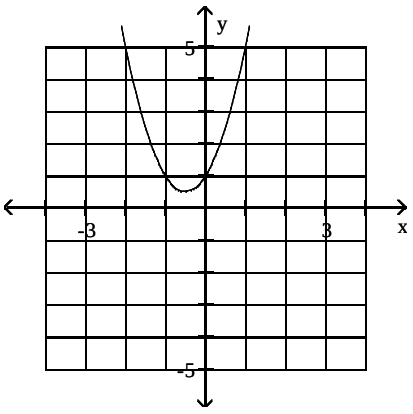
A)



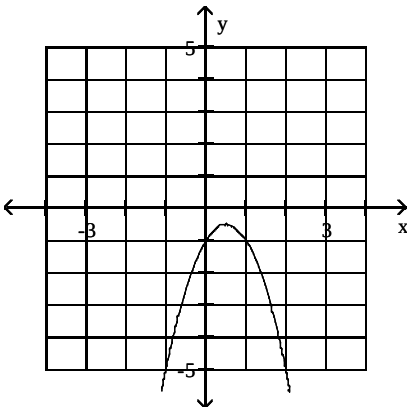
B)



C)



D)



Find the absolute maximum and absolute minimum values of the function, if they exist, on the indicated interval.

38) $f(x) = -x^2 + 14x - 48$: [6, 8] 38) _____

A) Absolute maximum: 1; absolute minimum: 0

B) Absolute maximum: 1; absolute minimum: $\frac{1}{4}$

C) Absolute maximum: 2; absolute minimum: 0

D) Absolute maximum: 97; absolute minimum: 1

39) $f(x) = x^2 - 6x + 12$; [–1, 5] 39) _____

A) Absolute maximum: 7, absolute minimum: 3

B) Absolute maximum: 19, absolute minimum: 3

C) Absolute maximum: 19, absolute minimum: 7

D) Absolute maximum: 3

40) $f(x) = x^3 - 3x + 5$; [–4, 1] 40) _____

A) Absolute minimum: 1

B) Absolute maximum: 7, absolute minimum: –47

C) Absolute maximum: 7

D) Absolute maximum: 3, absolute minimum: 1

41) $f(x) = -x^2 + 8x - 16$: [4, 4] 41) _____

A) Absolute maximum: 0; absolute minimum: $\frac{1}{4}$

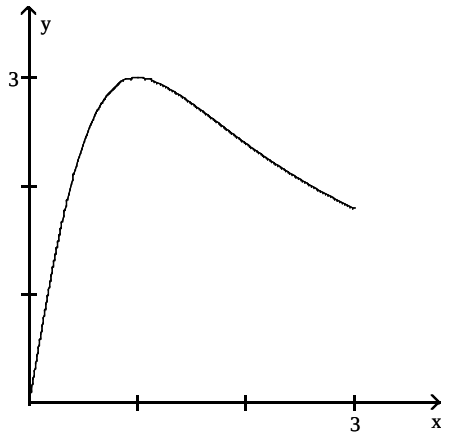
B) Absolute maximum: 0; absolute minimum: 0

C) Absolute maximum: 1; absolute minimum: 0

D) Absolute maximum: 32; absolute minimum: 0

Find the absolute maximum and absolute minimum values of the function, if they exist, over the indicated interval, and indicate the x–values at which they occur.

42) $f(x) = \frac{6x}{x^2 + 1}$; [0, 3] 42) _____



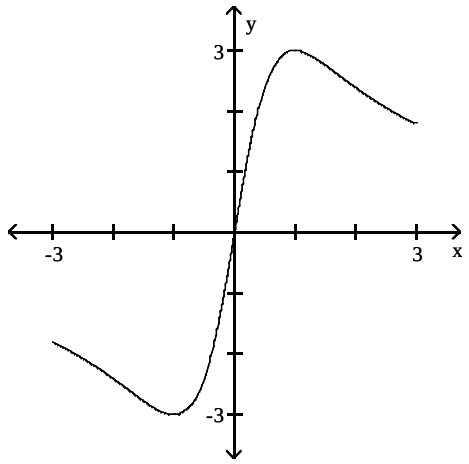
A) Absolute maximum = 3 at x = 1; absolute minimum = 0 at x = 0

B) Absolute maximum = 1.8 at x = 1; absolute minimum = 0 at x = 0

C) Absolute maximum = 0 at x = 0; absolute minimum = –1.8 at x = 1

D) Absolute maximum = 3 at x = 1; absolute minimum = –3 at x = 0

43) $f(x) = \frac{6x}{x^2 + 1}$; [–3, 3] 43) _____



A) Absolute maximum = 1.8 at x = 1; absolute minimum = –1.8 at x = –1
B) Absolute maximum = 3 at x = 1; absolute minimum = –3 at x = –1
C) Absolute maximum = 1.8 at x = –1; absolute minimum = 0 at x = 0
D) Absolute maximum = 3 at x = 1; absolute minimum = 0 at x = 0

Solve the problem.

44) Of all numbers whose difference is 4, find the two that have the minimum product. 44) _____
A) 8 and 4 B) 2 and –2 C) 0 and 4 D) 1 and 5

45) A carpenter is building a rectangular room with a fixed perimeter of 240 ft. What are the dimensions of the largest room that can be built? What is its area? 45) _____
A) 60 ft by 180 ft; 10,800 ft^2
B) 60 ft by 60 ft; 3600 ft^2
C) 120 ft by 120 ft; 14,400 ft^2
D) 24 ft by 216ft; 5184 ft^2

46) Minimize $Q = \sqrt{x} + \sqrt{y}$, where $x + y = 9$. 46) _____
A) $x = \frac{9}{2}$ and $y = \frac{9}{2}$
B) x = 9 and y = 0 or x = 0 and y = 9
C) $x = \frac{9}{2}$ and $y = \frac{9}{2}$ or x = 9 and y = 0
D) x = 3 and y = 3 or x = 0 and y = 0

47) 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. 47) _____
A) 5 in. by 5 in. by 2.5 in.; 62.5 $in.^3$
B) 6.7 in. by 6.7 in. by 3.3 in.; 148.1 $in.^3$
C) 6.7 in. by 6.7 in. by 1.7 in.; 74.1 $in.^3$
D) 3.3 in. by 3.3 in. by 3.3 in.; 37 $in.^3$

48) Maximize $Q = xy^2$, where x and y are positive numbers, such that $x + y^2 = 10$. 48) _____
A) $x = 0, y = \sqrt{10}$ B) x = 1, y = 3 C) $x = \sqrt{5}, y = 5$ D) $x = 5, y = \sqrt{5}$

49) Find the maximum profit given the following revenue and cost functions: 49) _____

$R(x) = 108x - x^2$

$C(x) = \frac{1}{3}x^3 - 6x^2 + 84x + 37$

where x is in thousands of units and R(x) and C(x) are in thousands of dollars.

A) 469 thousand dollars B) 395 thousand dollars

C) 251 thousand dollars D) 683 thousand dollars

Find an expression for dy/dx.

50) $y = (u + 3)(u - 3)$ and $u = x^2 + 6$ 50) _____

A) $4x(x^2 + 6)$ B) $2(x^2 + 6) + 2x$ C) $2(x^2 + 6)$ D) $4x(x^2 + 6)^2$

51) $y = \frac{u + 2}{u - 2}$ and $u = \sqrt{x} + 3$ 51) _____

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

Find dy/dx by implicit differentiation.

52) $xy^2 = 4$ 52) _____

A) $-\frac{y}{2x}$ B) $\frac{x}{2y}$ C) $\frac{2x}{y}$ D) $-\frac{2y}{x}$

53) $2y - x + xy = 4$ 53) _____

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

54) $y^2 - x^2 = 3$ 54) _____

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

55) $x^3 + y^3 = 8$ 55) _____

A) $-\frac{y^2}{x^2}$ B) $\frac{y^2}{x^2}$ C) $\frac{x^2}{y^2}$ D) $-\frac{x^2}{y^2}$

56) $xy + x + y - x^2y^2 = 0$ 56) _____

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

57) $x^{4/3} + y^{4/3} = 1$ 57) _____

A) $-(x/y)^{1/3}$ B) $(y/x)^{1/3}$ C) $-(y/x)^{1/3}$ D) $(x/y)^{1/3}$

58) $x^3 + 3x^2y + y^3 = 8$ 58) _____

A) $-\frac{x^2 + 3xy}{x^2 + y^2}$ B) $\frac{x^2 + 3xy}{x^2 + y^2}$ C) $\frac{x^2 + 2xy}{x^2 + y^2}$ D) $-\frac{x^2 + 2xy}{x^2 + y^2}$

59) $\frac{x + y}{x - y} = x^2 + y^2$ 59) _____

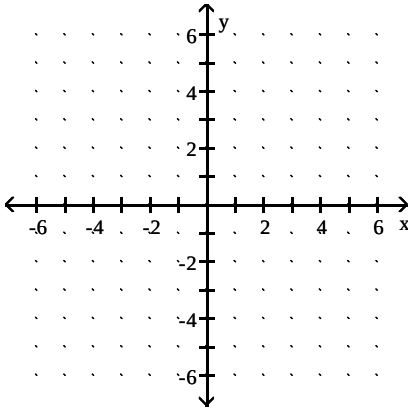
A) $\frac{x(x - y)^2 + y}{x + y(x - y)^2}$ B) $\frac{x(x - y)^2 + y}{x - y(x - y)^2}$ C) $\frac{x(x - y)^2 - y}{x - y(x - y)^2}$ D) $\frac{x(x - y)^2 - y}{x + y(x - y)^2}$

60) $8y^2 - 3x^2 = 7$ 60) _____

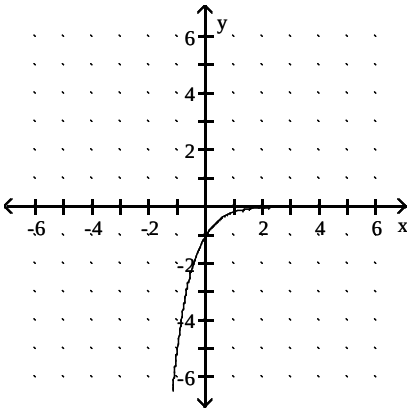
A) $\frac{3x}{8y}$ B) $\frac{6x + 7}{16y}$ C) $\frac{3x}{8}$ D) $\frac{3x^2}{16y}$

Graph.

61) $y = 5^x$ 61) _____



A)



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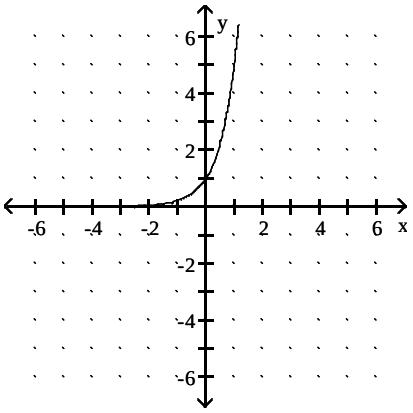

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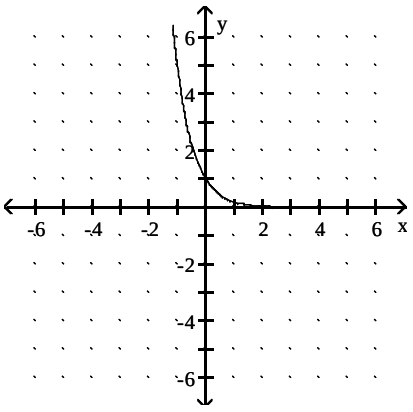
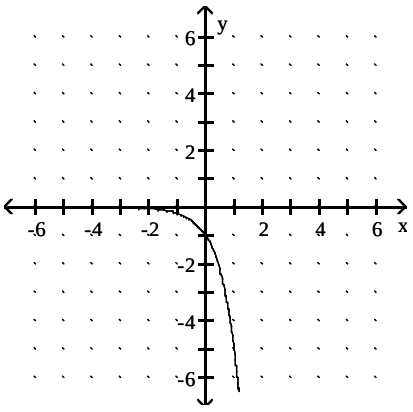
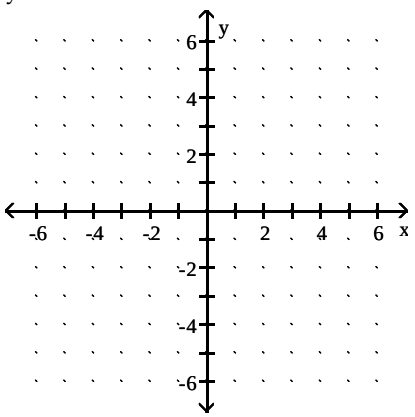


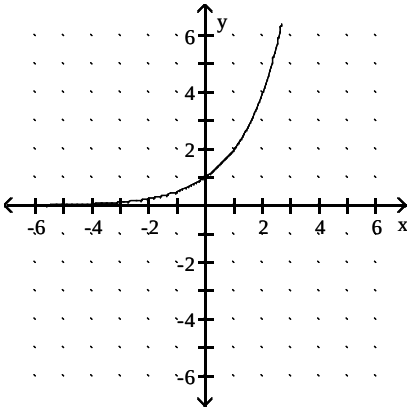
D)



62) $y = 2^{-x}$ 62) _____



A)



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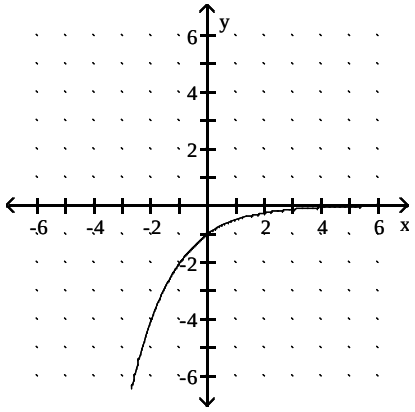
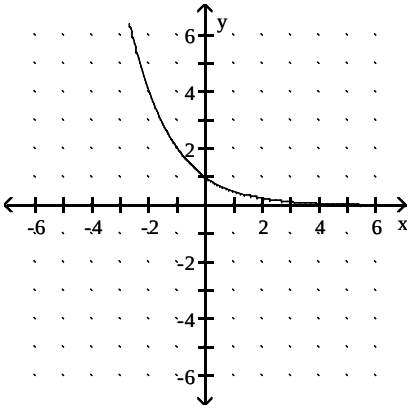
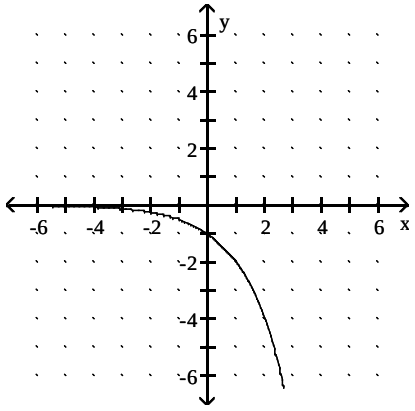


C)



D)



Write an equivalent exponential equation.

63) $\log_7 \frac{1}{49} = -2$ 63) _____

A) $7^{-2} = \frac{1}{49}$ B) $\left(\frac{1}{49}\right)^3 = 7$ C) $(-2)^7 = \frac{1}{49}$ D) $7^{49} = 2$

64) $\log_{16} 2 = \frac{1}{4}$ 64) _____

A) $2^{16} = 4$ B) $2^{1/4} = 16$ C) $1/4^2 = 16$ D) $16^{1/4} = 2$

65) $\log_2 1 = 0$ 65) _____

A) $2^0 = 1$ B) $2^1 = 0$ C) $1^0 = 2$ D) $0^2 = 1$

66) $\log_a X = Y$ 66) _____

A) $X^Y = a$ B) $Y^X = a$ C) $a^Y = X$ D) $a^X = Y$

Write an equivalent logarithmic equation.

67) $7^2 = 49$ 67) _____

A) $\log_{49} 7 = 2$ B) $\log_7 2 = 49$ C) $\log_7 49 = 2$ D) $\log_2 49 = 7$

68) $64^{1/3} = 4$ 68) _____

A) $\log_{1/3} 64 = 4$ B) $\log_{64} 4 = 1/3$ C) $\log_4 1/3 = 64$ D) $\log_4 64 = 1/3$

69) $3^{-2} = \frac{1}{9}$ 69) _____

A) $\log_3 \frac{1}{9} = -2$ B) $\log_{1/9} 3 = -2$ C) $\log_3 -2 = \frac{1}{9}$ D) $\log_{-2} \frac{1}{9} = 3$

70) $e^X = D$ 70) _____

A) $\log_X D = e$ B) $\log_e X = D$ C) $\log_D e = X$ D) $\log_e D = X$

Solve the exponential equation for t. Round your answer to three decimal places if necessary.

71) $e^t = 100$ 71) _____

A) 36.788 B) 2 C) 4.605 D) 271.828

72) $e^{-t} = 0.4$ 72) _____

A) 0.916 B) –0.147 C) –1.087 D) –0.916

73) $e^{0.05t} = 2$ 73) _____

A) 6.021 B) 0.035 C) 13.863 D) 40

Differentiate.

74) $y = 8xe^x - 8e^x$ 74) _____

A) $8e^x$ B) $8xe^x + 16e^x$ C) $8x$ D) $8xe^x$

75) $y = (x^2 - 2x + 4)\, e^x$ 75) _____

A) $(x^2 + 4x + 2)\, e^x$ B) $(x^2 + 2)\, e^x$

C) $\left(\frac{x^3}{3} + 2x + 4\right) e^x$ D) $(2x - 2)\, e^x$

76) $y = \dfrac{9e^x}{2e^x + 1}$ 76) _____

A) $\dfrac{9e^x}{(2e^x + 1)}$ B) $\dfrac{9e^x}{(2e^x + 1)^2}$ C) $\dfrac{e^x}{(2e^x + 1)^2}$ D) $\dfrac{9e^x}{(2e^x + 1)^3}$

77) $y = \dfrac{e^{-x} + 1}{e^x}$ 77) _____

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

78) $y = e^{9x/2}$ 78) _____

A) $e^{9x/2}$ B) $\dfrac{9}{2}e^{9x/2} - 1$ C) $\dfrac{9}{2}e^{9x/2}$ D) $\dfrac{9}{2}xe^{9x/2}$

79) $f(x) = 9e^{-3x}$ 79) _____

A) $9e^{-3x}$ B) $-27e^{-3x}$ C) $-3e^{-3x}$ D) $27e^{-3x}$

80) $f(x) = \dfrac{1}{7}e^{7x}$ 80) _____

A) $\dfrac{1}{7}e^{7x}$ B) $e^{x/7}$ C) e^{7x} D) $7e^{7x}$

81) $y = 4e^{x^2}$ 81) _____

A) $8xe^{4x^2}$ B) $8xe$ C) $8xe^{x^2}$ D) $8xe^{2x}$

82) $y = e^{10 - 2x}$ 82) _____

A) $-2e^{10 - 2x}$ B) $-2 \ln (10 - 2x)$ C) e^{-2} D) $10e^{10 - 2x}$

Find the derivative.

83) $f(x) = (\ln x)^4$ 83) _____

A) $\dfrac{4 (\ln x)^3}{x}$ B) $\dfrac{1}{x^4}$ C) $\dfrac{1}{(\ln x)^4}$ D) $4 (\ln x)^3$

84) $y = e^x \ln x$ 84) _____

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

85) $y = \dfrac{e^x}{\ln x}$ 85) _____

A) $\dfrac{x e^x \ln x - e^x}{x \ln^2 x}$ B) $x e^x$ C) $\dfrac{e^x - x e^x \ln x}{x \ln^2 x}$ D) $\dfrac{e^x + x e^x \ln x}{x}$

86) $y = e^{x^4} \ln x$ 86) _____

A) $\frac{e^{x^4} + 4x^4 e^{x^4} \ln x}{x}$ B) $\frac{e^{x^4} + 4x^3 e^{x^4} \ln x}{x}$

C) $\frac{e^{x^4} + 4e^{x^4} \ln x}{x}$ D) $\frac{4x^4 e^{x^4} + 1}{x}$

87) $f(x) = \ln (e^{5x} - 3)$ 87) _____

A) $\frac{1}{5e^{5x}}$ B) $\frac{5e^{5x}}{x}$ C) $\frac{1}{e^{5x} - 3}$ D) $\frac{5e^{5x}}{e^{5x} - 3}$

88) $f(x) = (\ln x)^9$ 88) _____

A) $\frac{9 (\ln x)^8}{x}$ B) $9 (\ln x)^8$ C) $\frac{1}{(\ln x)^9}$ D) $\frac{1}{x^9}$

Find $\frac{d^2y}{dx^2}$.

89) $y = 2x^4 - 6x^2 + 6$ 89) _____

A) $24x^2 - 12$ B) $8x^2 - 12x$ C) $8x^2 - 12$ D) $24x^2 - 12x$

90) $y = 2x^{3/2} - 6x^{1/2}$ 90) _____

A) $3x^{-1/2} + 3x^{-3/2}$ B) $3x^{1/2} - 3x^{-1/2}$

C) $1.5x^{1/2} + 1.5x^{-1/2}$ D) $1.5x^{-1/2} + 1.5x^{-3/2}$

91) $y = x^2 + \sqrt{x}$ 91) _____

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

92) $y = \frac{x}{x + 1}$ 92) _____

A) $(x + 1)^{-3}$ B) $-2(x + 1)^{-2}$ C) $(x + 1)^{-2}$ D) $-2(x + 1)^{-3}$

Provide an appropriate response.

93) Is it true that a function must be continuous at a point in order to have a derivative at that point? If a function is continuous at a point, must it have a derivative at that point? 93) _____

A) No; yes B) Yes; yes C) No; no D) Yes; no

94) What are four ways that a function may fail to be differentiable at a point? 94) _____

A) The function is not defined at the point; the function is discontinuous at the point; the function has a corner or similar sharp change in direction at the point; the function has a vertical tangent at the point.

B) The function is not defined at the point; the function is discontinuous at the point; the function has a limit at the point; the function has a vertical tangent at the point.

C) The function is not defined at the point; the function is discontinuous at the point; the function has a corner or similar sharp change in direction at the point; the function has a horizontal tangent at the point.

D) The function is not defined at the point; the function is discontinuous at the point; the function has a peak or a valley at the point; the function has a vertical tangent at the point.

95) Suppose that y is a function of u, and that u is itself a function of x. How does one find the derivative of y in terms of x? 95) _____

A) The difference rule: $\frac{d(y - u)}{dx} = \frac{dy}{dx} - \frac{du}{dx}$

B) The sum rule: $\frac{d(y + u)}{dx} = \frac{dy}{dx} + \frac{du}{dx}$

C) The chain rule: $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

D) The product rule: $\frac{d(y \cdot u)}{dx} = y \cdot \frac{du}{dx} + u \cdot \frac{dy}{dx}$

96) The first derivative is to instantaneous velocity as the second derivative is to _____. 96) _____

A) Instantaneous speed
B) Instantaneous acceleration
C) Average momentum
D) Average velocity

97) Critique the validity of the expression $\sqrt{\frac{d^2y}{dx^2}} = \frac{dy}{dx}$. 97) _____

A) It is valid, because $\frac{d^2y}{dx^2}$ cannot be negative.

B) It is not valid, because the notation $\frac{d^2y}{dx^2}$ does not mean the square of $\frac{dy}{dx}$.

C) It is not valid, because it should read "$\sqrt{\frac{d^2y}{dx^2}} = \pm\frac{dy}{dx}$".

D) It is valid, because a derivative can be squared the same as any function.

98) What is the difference between the information provided by a secant line and the information provided by a tangent line? 98) _____

A) The slope of a secant line is the instantaneous rate of change of a function at a point, whereas the slope of a tangent line is the average rate of change of a function over an interval.

B) The slope of a secant line drawn for a function f(x) is the average value of f(x) over an interval, whereas the slope of a tangent line is the instantaneous value of f(x) at a point.

C) A secant line touches the graph of a function just once, but a tangent line generally touches the curve twice.

D) The slope of a secant line is the average rate of change of a function over an interval, whereas the slope of a tangent line is the instantaneous rate of change of a function at a point.

99) What is the derivative of a function f(x)? 99) _____

A) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the average value of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.

B) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the instantaneous value of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.

C) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the instantaneous rate of change of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.

D) The derivative of the function f(x) is a function, usually denoted f'(x), whose output f'(a) is the average rate of change of f(x) at the point (a, f(a)), where a is any value of x in the domain for f(x) where f'(x) exists.