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

Find the derivative.

1) $f(x) = 2x^2 - 8x - 3$, find $f'(x)$

    A) $4x^2 - 8$ B) $2x - 8$ C) $4x - 8$ D) $2x^2 - 8$

1) _____

2) $y = 12x^{-2} + 16x^3 + 3x$, find $f'(x)$

    A) $-24x^{-3} + 48x^2$ B) $-24x^{-1} + 48x^2$

    C) $-24x^{-3} + 48x^2 + 3$ D) $-24x^{-1} + 48x^2 + 3$

2) _____

3) $f(x) = 9x^{7/5} - 5x^2 + 10^4$, find $f'(x)$

    A) $\dfrac{63}{5} x^{6/5} - 10x$ B) $\dfrac{63}{5} x^{6/5} - 10x + 4000$

    C) $\dfrac{63}{5} x^{2/5} - 10x$ D) $\dfrac{63}{5} x^{2/5} - 10x + 4000$

3) _____

4) $f(x) = \dfrac{4}{\sqrt{x}} - \dfrac{2}{x} + \dfrac{6}{x^4}$, find $f'(x)$

    A) $-\dfrac{2}{x^{3/2}} + \dfrac{2}{x^2} - \dfrac{24}{x^5}$ B) $-\dfrac{2}{x^{3/2}} - \dfrac{2}{x^2} - \dfrac{24}{x^3}$

    C) $-2\sqrt{x} + \dfrac{2}{x^2} - \dfrac{24}{x^3}$ D) $\dfrac{2}{x^{1/2}} - \dfrac{2}{x^2} - \dfrac{24}{x^5}$

4) _____

Find the derivative of the given function.

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

    A) $32x^3 + 48x^2 + 32x$ B) $64x^3 + 96x^2 + 32x$

    C) $32x^3 + 48x^2 + 16x$ D) $64x^3 + 48x^2 + 32x$

5) _____

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

6) $y = x^4 + 4x^3 + 2x - 2$; $x = 2$

    A) 80   B) 42   C) 40   D) 82

6) _____

7) $y = -8x^{-1} + 5x^{-2}$; $x = 2$

    A) $-\dfrac{13}{4}$ B) $-\dfrac{3}{4}$ C) $\dfrac{3}{4}$ D) $\dfrac{13}{4}$

7) _____

8) $y = 9x^{5/2} - 7x^{3/2}$; $x = 4$

    A) 8   B) 96   C) 6   D) 159

8) _____

Find an equation for the line tangent to given curve at the given value of x.

9) $y = \dfrac{x^2}{4}$; $x = 2$

    A) $y = 1x - 2$ B) $y = 1x + 1$ C) $y = 4x - 1$ D) $y = 1x - 1$

9) _____

10) $y = x^2 - 3$; $x = -3$

    A) $y = -3x - 12$ B) $y = -6x - 21$ C) $y = -6x - 12$ D) $y = -6x - 24$

11) $y = x^2 - x$; $x = -2$

    A) $y = -5x + 4$ B) $y = -5x + 2$ C) $y = -5x - 4$ D) $y = -5x - 2$

12) $y = x^3 - 25x - 2$; $x = 5$

    A) $y = 50x - 252$ B) $y = 50x - 2$ C) $y = -2$ D) $y = 48x - 252$

Solve the following.

13) Find all points of the graph of $f(x) = 2x^2 + 6x$ whose tangent lines are parallel to the line $y - 26x = 0$.

    A) (7, 140)   B) (8, 176)   C) (6, 108)   D) (5, 80)

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

14) $y = x^2 + 2x - 3$

    A) $\dfrac{1}{2}$ B) 0   C) 1   D) -1

15) $y = x^3 - 3x^2 + 1$

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

Give an appropriate answer.

16) If $g'(-3) = 8$ and $h'(-3) = 6$, find $f'(-3)$ for $f(x) = -3g(x) - 2h(x) + 3$.

    A) -33   B) -9   C) -12   D) -36

Solve the problem.

17) The total cost to produce x handcrafted wagons is $C(x) = 130 + 2x - x^2 + 7x^3$. Find the marginal cost when $x = 6$.

    A) 1488   B) 1618   C) 876   D) 746

18) If the price of a product is given by $P(x) = \dfrac{1024}{x} + 2200$, where x represents the demand for the product, find the rate of change of price when the demand is 2.

    A) 512   B) 256   C) -256   D) -512

19) The power P (in W) generated by a particular windmill is given by $P = 0.015 V^3$ where V is the velocity of the wind (in mph). Find the instantaneous rate of change of power with respect to velocity when the velocity is 11.3 mph. Round your answer to the nearest tenth.

    A) 12.8 W/mph   B) 43.3 W/mph   C) 5.7 W/mph   D) 0.5 W/mph

20) The velocity of water in ft/s at the point of discharge is given by $v = 14.44\sqrt{P}$, where P is the pressure in lb/in.^{2} of the water at the point of discharge. Find the rate of change of the velocity with respect to pressure if the pressure is 20.00 lb/in.^{2}.

    A) 3.23 ft/s per lb/in.^{2} B) 1.6144 ft/s per lb/in.^{2}

    C) .3610 ft/s per lb/in.^{2} D) 32.29 ft/s per lb/in.^{2}

21) Exposure to ionizing radiation is known to increase the incidence of cancer. One thousand laboratory rats are exposed to identical doses of ionizing radiation, and the incidence of cancer is recorded during subsequent days. The researchers find that the total number of rats that have developed cancer t months after the initial exposure is modeled by $N(t) = 1.21t^{2.1}$ for $0 \le t \le 10$ months. Find the rate of growth of the number of cancer cases at the 7th month. Round your answer to the nearest tenth, if necessary.

21) _____

   A) 25.6 cases/month   B) 21.6 cases/month
   C) 151.3 cases/month   D) 16.6 cases/month

22) $A(x) = -0.015x^3 + 1.05x$ gives the alcohol level in an average person's bloodstream x hours after drinking 8 oz of 100–proof whiskey. If the level exceeds 1.5 units, a person is legally drunk. Find the rate of change of alcohol level with respect to time.

22) _____

   A) $\dfrac{dA}{dx} = -0.045x^2 + 1.05$ B) $\dfrac{dA}{dx} = -0.045x^3 + 1.05$

   C) $\dfrac{dA}{dx} = -0.015x^2 + 1.05$ D) $\dfrac{dA}{dx} = -0.045x^2 + 1.05x$

23) The median weight, w, of a girl between the ages of 0 and 36 months can be approximated by the function

$$w(t) = 0.0006t^3 - 0.0484t^2 + 1.61t + 7.60,$$

where t is measured in months and w is measured in pounds.
For a girl of median weight, find the rate of change of weight with respect to time at age 20 months.

23) _____

   A) 0.086 lb/mo   B) 0.394 lb/mo   C) 0.882 lb/mo   D) 1.362 lb/mo

Use the product rule to find the derivative.

24) $f(x) = (4x - 3)(5x + 1)$

24) _____

   A) $f'(x) = 40x - 19$ B) $f'(x) = 40x - 5.5$ C) $f'(x) = 20x - 11$ D) $f'(x) = 40x - 11$

25) $f(x) = (5x - 5)(\sqrt{x} + 4)$

25) _____

   A) $f'(x) = 7.5x^{1/2} - 2.5x^{-1/2} + 20$ B) $f'(x) = 3.33x^{1/2} - 5x^{-1/2} + 20$
   C) $f'(x) = 3.33x^{1/2} - 2.5x^{-1/2} + 20$ D) $f'(x) = 7.5x^{1/2} - 5x^{-1/2} + 20$

26) $f(x) = (x^2 - 5x + 2)(5x^3 - x^2 + 5)$

26) _____

   A) $f'(x) = 25x^4 - 104x^3 + 45x^2 + 6x - 25$ B) $f'(x) = 25x^4 - 100x^3 + 45x^2 + 6x - 25$
   C) $f'(x) = 5x^4 - 100x^3 + 45x^2 + 6x - 25$ D) $f'(x) = 5x^4 - 104x^3 + 45x^2 + 6x - 25$

27) $f(x) = (6\sqrt{x} - 2)(5\sqrt{x} + 7)$

27) _____

   A) $f'(x) = 30x + 32x^{1/2}$ B) $f'(x) = 30 + 16x^{-1/2}$
   C) $f'(x) = 30 + 32x^{-1/2}$ D) $f'(x) = 30x + 16x^{1/2}$

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

28) _____

   A) $f'(x) = 6x^4 + 16$ B) $f'(x) = 144x^{15} + 96x^3$
   C) $f'(x) = 72x^7 + 192x^3$ D) $f'(x) = 9x^{16} + 64$

Use the quotient rule to find the derivative.

29) $f(x) = \dfrac{1}{x^7 + 2}$

    A) $f'(x) = \dfrac{1}{(7x^7 + 2)^2}$ B) $f'(x) = -\dfrac{1}{(7x^7 + 2)^2}$

    C) $f'(x) = -\dfrac{7x^6}{(x^7 + 2)^2}$ D) $f'(x) = \dfrac{7x^6}{(x^7 + 2)^2}$

29) _____

30) $y = \dfrac{x^2 - 3x + 2}{x^7 - 2}$

    A) $\dfrac{dy}{dx} = \dfrac{-5x^8 + 18x^7 - 14x^6 - 3x + 6}{(x^7 - 2)^2}$ B) $\dfrac{dy}{dx} = \dfrac{-5x^8 + 18x^7 - 13x^6 - 4x + 6}{(x^7 - 2)^2}$

    C) $\dfrac{dy}{dx} = \dfrac{-5x^8 + 18x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$ D) $\dfrac{dy}{dx} = \dfrac{-5x^8 + 19x^7 - 14x^6 - 4x + 6}{(x^7 - 2)^2}$

30) _____

31) $g(x) = \dfrac{x^2 + 5}{x^2 + 6x}$

    A) $g'(x) = \dfrac{2x^3 - 5x^2 - 30x}{x^2(x + 6)^2}$ B) $g'(x) = \dfrac{4x^3 + 18x^2 + 10x + 30}{x^2(x + 6)^2}$

    C) $g'(x) = \dfrac{x^4 + 6x^3 + 5x^2 + 30x}{x^2(x + 6)^2}$ D) $g'(x) = \dfrac{6x^2 - 10x - 30}{x^2(x + 6)^2}$

31) _____

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

    A) $\dfrac{dy}{dx} = \dfrac{2x + 8}{x}$ B) $\dfrac{dy}{dx} = \dfrac{3x^2 + 8x - 3}{x}$

    C) $\dfrac{dy}{dx} = \dfrac{3x^2 + 8x - 3}{2x^{3/2}}$ D) $\dfrac{dy}{dx} = \dfrac{2x + 8}{2x^{3/2}}$

32) _____

33) $f(x) = \dfrac{x^{1.6} + 5}{x^{2.7} + 1}$

    A) $f'(x) = \dfrac{-1.1x^{3.3} + 1.6x^{0.6} - 13.5x^{1.7}}{(x^{2.7} + 1)^2}$

    B) $f'(x) = \dfrac{-1.1x^{3.3} - 1.1x^{1.6} - 13.5x^{1.7} - 13.5}{(x^{2.7} + 1)^2}$

    C) $f'(x) = \dfrac{-1.1x^{3.3} + 1.6x^{0.6} - 2.7x^{1.6} - 13.5x^{1.7} - 13.5}{x^{2.7} + 1}$

    D) $f'(x) = \dfrac{-1.1x^{3.3} + 1.6x^{0.6} - 2.7x^{1.6} + 5x^{1.7} - 13.5}{(x^{2.7} + 1)^2}$

33) _____

Write an equation of the tangent line to the graph of y = f(x) at the point on the graph where x has the indicated value.

34) $f(x) = (2x^2 + 5x - 2)(2x - 3)$, $x = 0$ 34) _____

    A) $y = -19x - 6$ B) $y = -\dfrac{1}{19}x + 6$ C) $y = -\dfrac{1}{19}x - 6$ D) $y = -19x + 6$

Solve the problem.

35) The total cost to produce x units of perfume is $C(x) = (3x + 9)(9x + 2)$. Find the marginal average   35) _____
cost function.

    A) $27 - \dfrac{18}{x^2}$ B) $54x + 87$ C) $27x + 87 + \dfrac{18}{x}$ D) $54 - \dfrac{87}{x}$

36) The demand function for a certain product is given by: 36) _____

$$D(p) = \frac{7p + 130}{10p + 13}.$$

Find the marginal demand D'(p).

    A) $D'(p) = \dfrac{-1209}{10p + 13}$ B) $D'(p) = \dfrac{-1209}{(10p + 13)^2}$

    C) $D'(p) = \dfrac{1209}{(10p + 13)^2}$ D) $D'(p) = \dfrac{1391 + 140p}{(10p + 13)^2}$

37) The total revenue for the sale of x items is given by: 37) _____

$$R(x) = \frac{200\sqrt{x}}{5 + x^{3/2}}.$$

Find the marginal revenue R'(x).

    A) $R'(x) = \dfrac{100(5x^{-1/2} + 4x)}{(5 + x^{3/2})^2}$ B) $R'(x) = \dfrac{100(5x^{1/2} - 2x)}{(5 + x^{3/2})^2}$

    C) $R'(x) = \dfrac{100(5x^{-1/2} - 2x)}{5 + x^{3/2}}$ D) $R'(x) = \dfrac{100(5x^{-1/2} - 2x)}{(5 + x^{3/2})^2}$

38) The population P, in thousands, of a small city is given by: 38) _____

$$P(t) = \frac{900t}{2t^2 + 7}.$$

where t = the time, in months. Find the growth rate.

    A) $P'(t) = \dfrac{900(7 - 2t^2)}{2t^2 + 7}$ B) $P'(t) = \dfrac{900(2t^2 - 7)}{(2t^2 + 7)^2}$

    C) $P'(t) = \dfrac{900(7 + 6t^2)}{(2t^2 + 7)^2}$ D) $P'(t) = \dfrac{900(7 - 2t^2)}{(2t^2 + 7)^2}$

Provide an appropriate response.

39) True or false? The derivative of the difference of two functions is the difference of their derivatives.   39) _____
   A) True   B) False

40) True or false? If marginal cost is decreasing then the average cost must be decreasing.   40) _____
   A) True   B) False

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

41) Revenues of a company are decreasing. One analyst says it is due to an increase in price. Is   41) _____
   this necessarily true? Explain.

42) What must be true about a demand function so that, at a given price per item, revenue will   42) _____
   decrease if the price per item is increased?

43) If $g(-3) = -3$, $g'(-3) = -1$, $f(-3) = 2$, and $f'(-3) = -3$, what is the value of $h'(-3)$ where $h(x) =$ 43) _____
   $f(x)g(x)$? Show your work.

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

Find the derivative.

44) $y = (4x + 3)^5$ 44) _____

   A) $\dfrac{dy}{dx} = 4(4x + 3)^4$ B) $\dfrac{dy}{dx} = 20(4x + 3)^4$

   C) $\dfrac{dy}{dx} = 5(4x + 3)^4$ D) $\dfrac{dy}{dx} = (4x + 3)^4$

45) $f(x) = (x^3 - 8)^{2/3}$ 45) _____

   A) $f'(x) = \dfrac{x^2}{\sqrt[3]{x^3 - 8}}$ B) $f'(x) = \dfrac{2x^2}{\sqrt[3]{x^3 - 8}}$ C) $f'(x) = \dfrac{x}{\sqrt[3]{x^3 - 8}}$ D) $f'(x) = \dfrac{2x}{\sqrt[3]{x^3 - 8}}$

46) $y = (x + 1)^2(x^2 + 1)^{-3}$ 46) _____

   A) $\dfrac{dy}{dx} = 2(x + 1)(x^2 + 1)^{-4}(2x^2 - 3x - 1)$ B) $\dfrac{dy}{dx} = -2(x + 1)(x^2 + 1)^{-4}(2x^2 + 3x - 1)$

   C) $\dfrac{dy}{dx} = 2(x + 1)(x^2 + 1)^{-4}(2x^2 + 3x - 1)$ D) $\dfrac{dy}{dx} = -2(x + 1)(x^2 + 1)^{-4}(2x^2 - 3x - 1)$

47) $y = \dfrac{\sqrt[3]{x^2 + 3}}{x}$ 47) _____

   A) $\dfrac{dy}{dx} = \dfrac{-x^2 - 9}{3x^2(x^2 + 3)^{2/3}}$ B) $\dfrac{dy}{dx} = \dfrac{-3}{x^2(x^2 + 3)^{2/3}}$

   C) $\dfrac{dy}{dx} = \dfrac{3}{x^2(x^2 + 3)^{2/3}}$ D) $\dfrac{dy}{dx} = \dfrac{x^2 + 9}{3x^2(x^2 + 3)^{2/3}}$

6

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

48) $f(x) = (x^2 + 28)^{4/5}$; $x = 2$

A) $y = \frac{4}{5}x + \frac{64}{5}$ 　　　　B) $y = \frac{8}{5}x + \frac{96}{5}$ 　　　　C) $y = \frac{8}{5}x + \frac{64}{5}$ 　　　　D) $y = \frac{8}{5}x$

Find all values of x for the given function where the tangent line is horizontal.

49) $f(x) = \sqrt{x^2 + 14x + 50}$

49) _____

A) –7 　　　　B) 0, –7 　　　　C) –7, 7 　　　　D) 0, 7

Find the derivative.

50) $y = (2x - 1)^3(x + 7)^{-3}$

50) _____

A) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-4}$ 　　　　B) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-3}$

C) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-4}$ 　　　　D) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-2}$

51) $y = -10e^{-4x}$

51) _____

A) $-10xe^{40x}$ 　　　　B) $-10e^{40x}$ 　　　　C) $40xe^{-4x}$ 　　　　D) $40e^{-4x}$

52) $y = 4e^{x^2}$

52) _____

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

53) $y = \frac{4e^x}{2e^x + 1}$

53) _____

A) $\frac{4e^x}{(2e^x + 1)}$ 　　　　B) $\frac{4e^x}{(2e^x + 1)^3}$ 　　　　C) $\frac{4e^x}{(2e^x + 1)^2}$ 　　　　D) $\frac{e^x}{(2e^x + 1)^2}$

54) $y = \frac{e^{-x} + 1}{e^x}$

54) _____

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

55) $y = (x + 8)^4 e^{-3x}$

55) _____

A) $-12(x + 8)^3 e^{-3x}$ 　　　　B) $-(x + 8)^3(3x + 20) e^{-4x}$
C) $(x + 8)^3(x + 12) e^{-3x}$ 　　　　D) $-(x + 8)^3(3x + 20) e^{-3x}$

56) $y = 4^{12x}$

56) _____

A) $4 (\ln 12) 4^{12x}$ 　　　　B) $48 (\ln 12) 4^{12x}$ 　　　　C) $12 (\ln 4) 4^{12x}$ 　　　　D) $48 (\ln 4) 4^{12x}$

57) $y = 4(3^{8x} - 7) - 4$

57) _____

A) $24 \ln 12 (3^{8x} - 7)$ 　　　　B) $24 \ln 3 (3^{8x} - 7)$
C) $32 \ln 12 (3^{8x} - 7)$ 　　　　D) $32 \ln 3 (3^{8x} - 7)$

58) $y = 20^{x-1}$

    A) $20^{x-1} \ln 20$ B) $20 \ln 20$

    C) $20^{x-1} \ln 20^{x-1}$ D) $20^{x-1} \ln x$

58) _____

Solve the problem.

59) The sales in thousands of a new type of product are given by $S(t) = 280 - 30e^{-0.8t}$, where t represents time in years. Find the rate of change of sales at the time when $t = 6$.

    A) 0.2 thousand per year   B) –0.2 thousand per year

    C) –2873.8 thousand per year   D) 2873.8 thousand per year

59) _____

60) The demand function for a certain book is given by the function $x = D(p) = 54e^{-0.004p}$. Find the marginal demand $D'(p)$.

    A) $D'(p) = 0.216e^{-0.004p}$ B) $D'(p) = -0.004e^{-0.004p}$

    C) $D'(p) = -0.216pe^{-0.004p-1}$ D) $D'(p) = -0.216e^{-0.004p}$

60) _____

61) When a particular circuit containing a resistor, an inductor, and a capacitor in series is connected to a battery, the current i (in amperes) is given by $i = 25e^{-3t}(e^{2.6t} - e^{-2.6t})$ where t is the time (in seconds). Find the time at which the maximum current occurs. Round to the nearest tenth of a second.

    A) 0.5 sec   B) 0.6 sec   C) 1.4 sec   D) 1.5 sec

61) _____

62) In one city, 20% of all aluminum cans distributed will be recycled each year. A juice company distributes 276,000 cans. The number still in use after time t, in years, is given by

$$N(t) = 276{,}000(0.20)^t.$$

Find $N'(t)$.

    A) $N'(t) = 276{,}000(\ln 0.20)(0.20)^t$ B) $N'(t) = 276{,}000(\ln t)(0.20)^t$

    C) $N'(t) = 276{,}000(0.20)^t$ D) $N'(t) = 276{,}000t(0.20)^{t-1}$

62) _____

63) Rats are not native to the islands off the western coast of South America. However, rats are often introduced accidentally to an island by visiting ships. The population of introduced rats follows the logistic function with $k = 0.00022$ and t in months. Assume that there are 9 rats initially and that the maximum population size is 12,000. Find the rate of growth of the population after 3 months.

    A) 6963 rats/month   B) 7090 rats/month

    C) 6954 rats/month   D) 6982 rats/month

63) _____

64) The natural resources of an island limit the growth of the population to a limiting value of 2703. The population of the island is given by the logistic equation

$$P(t) = \frac{2703}{1 + 4.91e^{-0.32t}},$$

where t is the number of years after 1980. What is the population of the island in 1982?

    A) 715   B) 678   C) 592   D) 753

64) _____

65) Researchers have found that the maximum number of successful trials that a laboratory rat can complete in a week is given by

$$P(t) = 51(1 - e^{-0.4t}),$$

where t is the number of weeks the rat has been trained. What is the maximum number of successful trials that a laboratory rat can complete in a week after being trained for 6 weeks.

A) 17   B) 46   C) 11   D) 56

65) _____

Find the derivative of the function.

66) $y = \ln 4x$

A) $-\dfrac{1}{x}$ B) $\dfrac{1}{x}$ C) $-\dfrac{1}{4x}$ D) $\dfrac{1}{4x}$

66) _____

67) $y = \ln 6x^2$

A) $\dfrac{2}{x}$ B) $\dfrac{12}{x}$ C) $\dfrac{2x}{x^2 + 6}$ D) $\dfrac{1}{2x + 6}$

67) _____

68) $y = \ln \left| 5x^3 - x^2 \right|$

A) $\dfrac{15x - 2}{5x^2 - x}$ B) $\dfrac{15x - 2}{5x^2}$ C) $\dfrac{5x - 2}{5x^2 - x}$ D) $\dfrac{15x - 2}{5x^3 - x}$

68) _____

69) $y = \ln (x + 6)^5$

A) $\dfrac{5}{x + 5}$ B) $\dfrac{5}{x}$ C) $\dfrac{5}{x + 6}$ D) $\dfrac{6}{x + 6}$

69) _____

70) $y = (5x^2 + 5) \ln(x + 10)$

A) $10x \ln(x + 10)$

B) $\dfrac{5x^2 + 5}{x + 10} + 10x \ln(x + 10)$

C) $\dfrac{10x}{x + 10}$

D) $\dfrac{5x^2 + 5}{\ln(x + 10)} + 10x \ln(x + 10)$

70) _____

Find the derivative.

71) $y = e^x \ln x, \ x > 0$

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

71) _____

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

A) $\dfrac{e^{x^4} + 4x^4 e^{x^4} \ln x}{x}$

B) $\dfrac{4x^4 e^{x^4} + 1}{x}$

C) $\dfrac{e^{x^4} + 4x^3 e^{x^4} \ln x}{x}$

D) $\dfrac{e^{x^4} + 4e^{x^4} \ln x}{x}$

72) _____

Find the derivative of the function.

73) $y = \log (7x)$

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

73) _____

74) $y = \log |3 - x|$

A) $-\dfrac{1}{\ln 10}$
B) $-\dfrac{1}{\ln 10 \, (3 - x)}$
C) $\dfrac{1}{\ln 10 \, (3 - x)}$
D) $-\dfrac{3 - x}{\ln 10}$

74) _____

75) $y = \log_6 \sqrt{7x + 1}$

A) $\dfrac{7}{\ln 6}$
B) $\dfrac{7}{2(\ln 6)(7x + 1)}$
C) $\dfrac{7}{\ln 6 \, (7x + 1)}$
D) $\dfrac{7 \ln 6}{7x + 1}$

75) _____

Solve the problem.

76) Assume the total revenue from the sale of x items is given by $R(x) = 29 \ln (9x + 1)$, while the total cost to produce x items is $C(x) = x/5$. Find the approximate number of items that should be manufactured so that profit, $R(x) - C(x)$, is maximum.

    A) 52 items   B) 145 items   C) 206 items   D) 266 items

76) _____

77) Suppose that the demand function for x units of a certain item is $p = 110 + \dfrac{210 \ln(x + 5)}{x}$, where p is the price per unit, in dollars. Find the marginal revenue.

A) $\dfrac{dR}{dx} = \dfrac{210[x - [\ln(x + 5)]^2]}{x^2 \ln(x + 5)}$

B) $\dfrac{dR}{dx} = 110 + \dfrac{210}{x + 5}$

C) $\dfrac{dR}{dx} = 110 + \dfrac{210}{\ln(x + 5)}$

D) $\dfrac{dR}{dx} = \dfrac{210 [x - (x + 5) \ln(x + 5)]}{x^2(x + 5)}$

77) _____

78) Students in a math class took a final exam. They took equivalent forms of the exam in monthly intervals thereafter. The average score S(t), in percent, after t months was found to be given by
    $S(t) = 80 - 16 \ln (t + 1), \quad t \geq 0.$
Find S'(t).

A) $S'(t) = 80 - \dfrac{16}{t + 1}$

B) $S'(t) = -16 \ln\left(\dfrac{1}{t + 1}\right)$

C) $S'(t) = \dfrac{16}{t + 1}$

D) $S'(t) = -\dfrac{16}{t + 1}$

78) _____

1) C
2) C
3) C
4) A
5) B
6) D
7) C
8) D
9) D
10) C
11) C
12) A
13) D
14) D
15) C
16) D
17) D
18) C
19) C
20) B
21) B
22) A
23) B
24) D
25) A
26) A
27) B
28) C
29) C
30) C
31) D
32) C
33) A
34) D
35) A
36) B
37) D
38) D
39) A
40) B
41) Answers will vary. Even if it is true that an increase in price is responsible, an increase in sales may also be partly or wholly responsible.
42) Marginal revenue is zero.
43) Product Rule:
   $h'(x) = f'(x)g(x) + f(x)g'(x)$
   $h'(-3) = f'(-3)g(-3) + f(-3)g'(-3) = (-3)(-3) + (2)(-1)$
   $h'(-3) = 7$
44) B
45) B
46) B

47) A
48) C
49) A
50) A
51) D
52) A
53) C
54) A
55) D
56) C
57) D
58) A
59) A
60) D
61) A
62) A
63) A
64) D
65) B
66) B
67) A
68) A
69) C
70) B
71) D
72) A
73) D
74) B
75) B
76) B
77) B
78) D