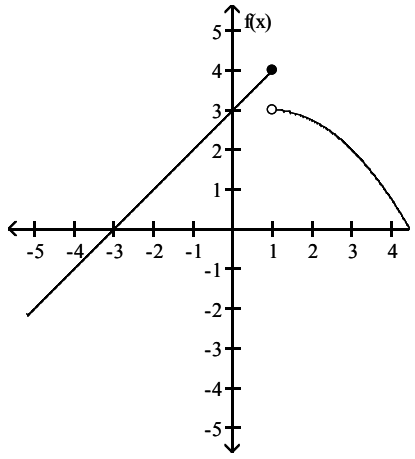
1810 Final Exam Practice

Name_____

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

**Decide whether the limit exists. If it exists, find its value.**

1) $\lim_{x \to 1^+} f(x)$ 1) _____




A) 4

B) 3

C) Does not exist

D) $3\frac{1}{2}$

**Use the properties of limits to help decide whether the limit exists. If the limit exists, find its value.**

2) $\lim_{x \to 9} \frac{x^2 - 81}{x - 9}$ 2) _____

A) 1

B) Does not exist

C) 18

D) 9

3) $\lim_{h \to 0} \frac{(x + h)^3 - x^3}{h}$ 3) _____

A) $3x^2 + 3xh + h^2$

B) Does not exist

C) $3x^2$

D) 0

4) $\lim_{x \to \infty} \frac{4x^3 + 5x}{-6x^4 + 8x^3 + 10}$ 4) _____

A) 1 B) 0

C) $-\frac{2}{3}$ D) $\infty$

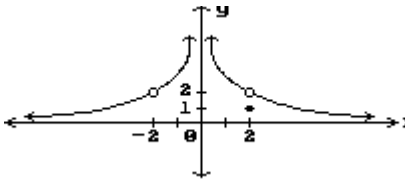
5) $\lim_{x \to \infty} \frac{-5x^2 + 2x - 4}{-2x^2 + 6}$ 5) _____

A) 0 B) $-\frac{3}{2}$

C) $\frac{5}{2}$ D) $\infty$

**Find all points where the function is discontinuous.**

6) 6) _____




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

B) $x = 0, x = 2$

C) $x = 2$

D) $x = -2, x = 0$

**Find all values x = a where the function is discontinuous.**

7) $f(x) = \frac{7x}{(2x - 4)(-6 - 2x)}$ 7) _____

A) $a = 0, 2, -3$

B) $a = 2, 3$

C) $a = 2, -3$

D) Nowhere

**Give an appropriate response.**

8) Find the limit of f(x) as x approaches 3 from the right. 8) _____

$$f(x) = \begin{cases} 0 & \text{if } x < 3 \\ x + 1 & \text{if } 3 \le x \le 4 \\ 5 & \text{if } x > 4 \end{cases}$$

A) 5

B) 0

C) 4

D) The limit does not exist.

**Find the average rate of change for the function over the given interval.**

9) $y = x^2 + 8x$ between $x = 4$ and $x = 7$ 9) _____

A) 19 B) 15

C) 35 D) $\frac{57}{7}$

**Give an appropriate response.**

10) Use a graphing utility to approximate the instantaneous rate of change of $f(x) = x^{1/x}$ at $x = 4$. 10) _____

A) –0.6667 B) –0.0683

C) –0.034 D) –0.0478

**Give an appropriate answer.**

11) Find the instantaneous rate of change for the function $x^2 + 7x$ at $x = -8$. 11) _____

A) –16 B) –9

C) –1 D) 8

**Find the derivative.**

12) $y = 11x^{-2} + 9x^3 - 2x$, find f'(x) 12) _____

A) $-22x^{-3} + 27x^2 - 2$

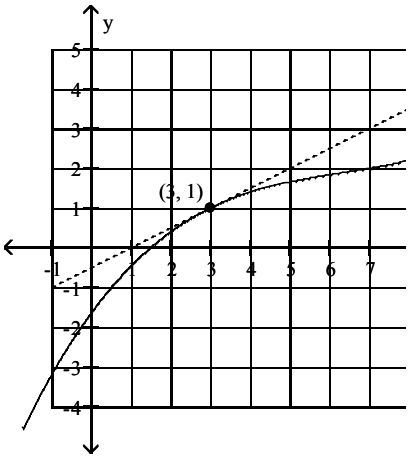
B) $-22x^{-1} + 27x^2 - 2$

C) $-22x^{-1} + 27x^2$

D) $-22x^{-3} + 27x^2$

**Estimate the slope of the tangent line to the curve at the given point.**

13) 13) _____




A) –1 B) 1

C) 1/2 D) 2

**Find f'(x) when x has the given value.**

14) $f(x) = 5x^2 + 7x$; $x = 7$ 14) _____

A) 119 B) –147

C) 98 D) 77

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

15) $y = 4x^{3/2} - 5x^{1/2}$; $x = 16$ 15) _____

A) $\frac{187}{8}$ B) $\frac{91}{4}$

C) $\frac{197}{8}$ D) $\frac{101}{4}$

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

16) $y = x^2 - 4$ at $x = 2$ 16) _____

A) $y = 4x - 8$

B) $y = 4x - 16$

C) $y = 2x - 8$

D) $y = 4x - 12$

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

17) $y = x^4 + 7x^3 + 2x + 2;\ x = 3$ 17) _____

A) 299 B) 148

C) 301 D) 146

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

18) $y = x^2 + 2x - 3$ 18) _____

A) –1 B) 0

C) $\frac{1}{2}$ D) 1

**Solve the problem.**

19) The total cost to produce x handcrafted wagons is $C(x) = 100 + 3x - x^2 + 7x^3$. Find the marginal cost when $x = 4$. 19) _____

A) 444 B) 331

C) 431 D) 544

**Find the equation of the tangent line to the curve when x has the given value.**

20) $f(x) = 6 - x^2;\ x = 7$ 20) _____

A) $y = -14x + 55$

B) $y = 14x - 55$

C) $y = -2x$

D) $y = 7x + 55$

**Use a graphing calculator to find f'(x) when x has the given value.**

21) $f(x) = \frac{5}{x};\ x = -3$ 21) _____

A) $\frac{-5}{9}$ B) –3

C) $\frac{5}{9}$ D) $\frac{-2}{9}$

**Solve the problem.**

22) The profit in dollars from the sale of x thousand compact disc players is $P(x) = x^3 - 2x^2 + 4x + 8$. Find the marginal profit when the value of x is 6. 22) _____

A) \$198 B) \$88

C) \$96 D) \$206

23) 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 $N(t) = 1.21t^{2.3}$ for $0 \le t \le 10$ months. Find the rate of growth of the number of cancer cases at the 7th month. 23) _____

A) 38.9 cases/month

B) 29.9 cases/month

C) 34.9 cases/month

D) 244.5 cases/month

24) For a motorcycle traveling at speed v (in mph) when the brakes are applied, the distance d (in feet) required to stop the motorcycle may be approximated by the formula $d = .05\ v^2 + v$. Find the instantaneous rate of change of distance with respect to velocity when the speed is 40 mph. 24) _____

A) 41 mph B) 10 mph

C) 5 mph D) 4 mph

**Find the derivative.**

25) $y = \sqrt{4x + 2}$ 25) _____

A) $\frac{dy}{dx} = \frac{8}{\sqrt{4x + 2}}$

B) $\frac{dy}{dx} = \frac{1}{\sqrt{4x + 2}}$

C) $\frac{dy}{dx} = \frac{2}{\sqrt{4x + 2}}$

D) $\frac{dy}{dx} = \frac{4}{\sqrt{4x + 2}}$

26) $y = (x^{-2} + x)^{-3}$ 26) _____

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

B) $\frac{dy}{dx} = \frac{3x^5(2 - x^3)}{(1 + x^3)^3}$

C) $\frac{dy}{dx} = \frac{3x^5(2 - x^3)}{(1 + x^3)^4}$

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

27) $y = e^{3x^2} + x$ 27) _____

A) $6xe^{2x} + 1$

B) $6xe + 1$

C) $6xe^{3x^2} + 1$

D) $6xe^{x^2} + 1$

**Solve the problem.**

28) The sales in thousands of a new type of product are given by $S(t) = 150 - 40e^{-.8t}$, where t represents time in years. Find the rate of change of sales at the time when $t = 4$. 28) _____

A) 777.4 thousand per year

B) –1.3 thousand per year

C) 1.3 thousand per year

D) –777.4 thousand per year

29) The following formula accurately models the relationship between the size of a certain type of tumor and the amount of time that it has been growing: 29) _____

$$V(t) = 500\left(1 - e^{-.0023t}\right)^3,$$

where t is in months and V(t) is measured in cubic centimeters. Calculate the rate of change of tumor volume at 160 months.

A) 0.166 $cm^3$/month

B) 0.226 $cm^3$/month

C) 0.981 $cm^3$/month

D) 0.355 $cm^3$/month

30) Suppose that the amount in grams of a radioactive substance present at time t (in years) is given by $A(t) = 830e^{-.50t}$. Find the rate of change of the quantity present at the time when $t = 7$. 30) _____

A) –32.8 grams per year

B) 32.8 grams per year

C) –12.5 grams per year

D) 12.5 grams per year

**Provide an appropriate response.**

31) If $Q = 107 - e^{-.4t}$ what happens to Q and to Q' as t increases? 31) _____

A) Q decreases and Q' increases.

B) Q decreases and Q' decreases.

C) Q increases and Q' decreases.

D) Q increases and Q' increases.

**Find the derivative of the function.**

32) $y = \ln (9 + x^2)$ 32) _____

A) $\frac{2}{x}$ B) $\frac{18}{x}$

C) $\frac{1}{2x + 9}$ D) $\frac{2x}{x^2 + 9}$

**Find the derivative.**

33) $y = \frac{e^x}{\ln x}$ 33) _____

A) $\frac{e^x + x\, e^x \ln x}{x}$

B) $x\, e^x$

C) $\frac{x\, e^x \ln x - e^x}{x \ln^2 x}$

D) $\frac{e^x - x\, e^x \ln x}{x \ln^2 x}$

34) $y = e^{x^4} \ln x$ 34) _____

A) $\frac{4x^4\, e^{x^4} + 1}{x}$

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

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

D) $\frac{e^{x^4} + 4x^3\, e^{x^4} \ln x}{x}$

**Solve the problem.**

35) Suppose that the population of a certain type of insect in a region near the equator is given by $P(t) = 25 \ln (t + 9)$, where t represents the time in days. Find the rate of change of the population when $t = 2$. 35) _____

A) 2.8 insects

B) 12.5 insects

C) 2.3 insects

D) 5.9 insects

**Find the open interval(s) where the function is changing as requested.**

36) Increasing; $y = x^4 - 18x^2 + 81$ 36) _____

A) (–3, 0)

B) $(-\infty, 0)$

C) (–3, 3)

D) (–3, 0), $(3, \infty)$

37) Decreasing; $f(x) = -\sqrt{x + 3}$ 37) _____

A) $(3, \infty)$ B) $(-\infty, -3)$

C) $(-3, \infty)$ D) $(-\infty, 3)$

**Solve the problem.**

38) Suppose the total cost C(x) to manufacture a quantity x of insecticide (in hundreds of liters) is given by $C(x) = x^3 - 27x^2 + 240x + 800$. Where is C(x) decreasing? 38) _____

A) (10, 800) B) (8, 10)

C) (0, 800) D) (8, 800)

**Find the values of any relative extrema.**

39) $f(x) = x^3 - 3x^2 + 1$ 39) _____

A) Relative maximum of 1 at 0; Relative minimum of –3 at 2.

B) No relative extrema.

C) Relative maximum of 1 at 0.

D) Relative maximum of 0 at 1; Relative minimum of –3 at –2.

**Solve the problem.**

40) The annual revenue and cost functions for a manufacturer of grandfather clocks are approximately $R(x) = 500x - 0.02x^2$ and $C(x) = 200x + 100{,}000$, where x denotes the number of clocks made. What is the maximum annual profit? 40) _____

A) $1,125,000

B) $1,225,000

C) $1,025,000

D) $1,325,000

**Find the largest open intervals where the function is concave upward.**

41) $f(x) = x^3 - 3x^2 - 4x + 5$ 41) _____

A) $(-\infty, 1), (1, \infty)$

B) None

C) $(-\infty, 1)$

D) $(1, \infty)$

**The function gives the distances (in feet) traveled in time t (in seconds) by a particle. Find the velocity and acceleration at the given time.**

42) $s = 9t^3 + 3t^2 + 9t + 5, t = 2$ 42) _____

A) $v = 114$ ft/s, $a = 129$ ft/s$^2$

B) $v = 66$ ft/s, $a = 60$ ft/s$^2$

C) $v = 60$ ft/s, $a = 66$ ft/s$^2$

D) $v = 129$ ft/s, $a = 114$ ft/s$^2$

**Find the values of any relative extrema.**

43) $f(x) = x^2 + 2x - 3$ 43) _____

A) Relative minimum of –2 at 0.

B) Relative minimum of 0 at –2.

C) Relative maximum of –4 at –1.

D) Relative minimum of –4 at –1.

**Find all relative maxima or minima.**

44) $y = 2xe^{-x}$ 44) _____

A) (–1, –2e), relative maximum

B) (–1, –2e), relative minimum

C) (1, 2/e), relative maximum

D) (1, 2/e), relative minimum

**Use a graphing calculator or computer graphing software to solve the problem (correct to one decimal place).**

45) Find the x–coordinate of the relative minimum for the function $f(x) = x(x - 5)^{2/3}$ with domain all real numbers. 45) _____

A) 5.4 B) 4.7

C) 6.6 D) 5.0

**Find the requested value of the second derivative of the function.**

46) $f(x) = x^4 + 3x^3 - 3x + 3$; Find $f''(-1)$. 46) _____

A) –6 B) 7

C) –11 D) –2

**Find the location of the indicated absolute extremum within the specified domain.**

47) Minimum of $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x - 4$; $[-2, 5]$ 47) _____

A) $x = -2$ B) $x = 1$

C) $x = 2$ D) $x = 0$

**Solve the problem.**

48) $P(x) = -x^3 + 15x^2 - 48x + 450$, $x \geq 3$ is an approximation to the total profit (in thousands of dollars) from the sale of x hundred thousand tires. Find the number of hundred thousands of tires that must be sold to maximize profit. 48) _____

A) 8 hundred thousand

B) 3 hundred thousand

C) 10 hundred thousand

D) 5 hundred thousand

49) 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 $p(x) = 34 - \frac{x}{12}$. How many candy bars must be sold to maximize revenue? 49) _____

A) 408 candy bars

B) 204 candy bars

C) 408 thousand candy bars

D) 204 thousand candy bars

**Find dy/dx by implicit differentiation.**

50) $2xy - y^2 = 1$ 50) _____

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

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

**The function gives the distances (in feet) traveled in time t (in seconds) by a particle. Find the velocity and acceleration at the given time.**

51) $s = 3t^3 + 3t^2 + 9t + 9$, $t = 3$ 51) _____

A) $v = 60$ ft/s, $a = 108$ ft/s$^2$

B) $v = 45$ ft/s, $a = 18$ ft/s$^2$

C) $v = 108$ ft/s, $a = 60$ ft/s$^2$

D) $v = 18$ ft/s, $a = 45$ ft/s$^2$

**Solve the problem.**

52) A man 6 ft tall walks at a rate of 5 ft/s away from a lamppost that is 13 ft high. At what rate is the length of his shadow changing when he is 65 ft away from the lamppost? 52) _____

A) $\frac{15}{19}$ ft/s B) $\frac{325}{6}$ ft/s

C) $\frac{30}{19}$ ft/s D) $\frac{30}{7}$ ft/s

53) The volume of a sphere is increasing at a rate of 3 cm$^3$/s. Find the rate of change of its surface area when its volume is $\frac{32\pi}{3}$ cm$^3$ 53) _____

A) $\frac{6\pi}{3}$ cm$^2$/s

B) 2 cm$^2$/s

C) $\frac{8}{3}$ cm$^2$/s

D) 3 cm$^2$/s

**Find the integral.**

54) $\int 9x^{-3}\,dx$ 54) _____

A) $x + 9C$

B) $-\frac{9}{2x^2} + C$

C) $9x^3$

D) $-27x + C$

55) $\int (x^{4/3} - 3x^{5/2})\,dx$ 55) _____

A) $\frac{3}{4}x^{7/3} - \frac{3}{7}x^{7/2} + C$

B) $\frac{3}{7}x^{7/3} - \frac{2}{7}x^{7/2} + C$

C) $\frac{3}{7}x^{7/3} - \frac{6}{7}x^{7/2} + C$

D) $\frac{3}{4}x^{7/3} - \frac{4}{7}x^{7/2} + C$

56) $\int (\sqrt{x} + \sqrt[3]{x})\,dx$ 56) _____

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

B) $2\sqrt{x} + 2\sqrt[3]{x} + C$

C) $2\sqrt{x} + 3\sqrt[3]{x} + C$

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

57) $\int (9x^{-5} - 6x^{-1})\,dx$ 57) _____

A) $-\frac{9}{4}x^{-4} - 6\ln|x| + C$

B) $\frac{9}{5}x^{-4} + 6\ln|x| + C$

C) $\frac{9}{5}x^{-4} - 6\ln|x| + C$

D) $-\frac{9}{4}x^{-4} + 6\ln|x| + C$

58) $\int \left(\frac{4}{x} + 2e^{x}\right) dx$ 58) _____

A) $\frac{8}{x^2} + 2xe^{x-1} + C$

B) $\frac{8}{x^2} + 2e^{x} + C$

C) $4\ln|x| + 2xe^{x-1} + C$

D) $4\ln|x| + 2e^{x} + C$

**Solve the problem.**

59) Suppose that the acceleration of an object is given by $a(t) = 5t^{2/3} + 2e^{-t}$. The object's initial velocity, $v(0)$, is 10 and the object's initial position, $s(0)$, is $-3$. Find $s(t)$. 59) _____

A) $s(t) = \frac{200t^{8/3}}{9} + 2e^{-t} + 8t - 5$

B) $s(t) = \frac{9t^{8/3}}{8} + 2e^{-t} + 12t - 5$

C) $s(t) = \frac{9t^{8/3}}{8} + 2e^{-t} + 10t - 3$

D) $s(t) = 3t^{5/3} - 2e^{-t} + 12$

60) Find the cost function if the marginal cost function is $C'(x) = 16x - 11$ and the fixed cost is \$4. 60) _____

A) $C(x) = 8x^2 - 11x + 3$

B) $C(x) = 16x^2 - 11x + 4$

C) $C(x) = 8x^2 - 11x + 4$

D) $C(x) = 16x^2 - 11x + 3$

**Find the integral.**

61) $\int (t^4 + e^{2t})\,dt$ 61) _____

A) $\frac{t^5}{5} + \frac{e^{2t}}{2} + C$

B) $\frac{t^5}{5} + e^{2t} + C$

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

D) $\frac{t^5}{5} + \frac{e^{3t}}{3} + C$

62) $\int \frac{8\,dy}{(y-9)^3}$ 62) _____

A) $\frac{-4}{(y-9)^2} + C$

B) $\frac{-2}{(y-9)^4} + C$

C) $\frac{4}{(y-9)^2} + C$

D) $\frac{2}{(y-9)^4} + C$

63) $\int te^{-7t^2}\,dt$ 63) _____

A) $\frac{1}{14}e^{-7t^2} + C$

B) $\frac{1}{7}e^{-7t^2} + C$

C) $-\frac{1}{14}e^{-7t^2} + C$

D) $-\frac{1}{7}e^{-7t^2} + C$

64) $\int \frac{19}{2+5y}\,dy$ 64) _____

A) $\frac{19}{5}\ln|2+5y| + C$

B) $18\ln|2+5y| + C$

C) $\frac{18}{5}\ln|2+5y| + C$

D) $19\ln|2+5y| + C$

65) $\int \frac{6x^5\,dx}{(5+x^6)^4}$ 65) _____

A) $-\frac{1}{5(5+x^6)^5}+C$

B) $\frac{1}{5}(5+x^6)^5+C$

C) $-\frac{1}{3(5+x^6)^3}+C$

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

66) $\int 9z\sqrt{3z^2-7}\,dz$ 66) _____

A) $\frac{1}{2}(3z^2-7)^{3/2}+C$

B) $(3z^2-7)^{3/2}+C$

C) $\frac{1}{2}z(3z^2-7)^{3/2}+C$

D) $z(3z^2-7)^{3/2}+C$

**Approximate the area under the graph of f(x) and above the x–axis using n rectangles. Use right endpoints.**

67) $f(x) = 2x^2 + x + 3$ from $x = 0$ to $x = 6$; $n = 6$ 67) _____

A) 200 B) 230

C) 211 D) 221

**Evaluate the definite integral.**

68) $\int_{-3}^{5} 5x^4\,dx$ 68) _____

A) 152 B) –3368

C) 3368 D) 16,840

**Use the definite integral to find the area between the x–axis and f(x) over the indicated interval.**

69) $f(x) = x^2 - 6x + 9;\ [2, 4]$ 69) _____

A) $\frac{1}{3}$ B) $\frac{2}{3}$

C) $\frac{7}{3}$ D) $\frac{4}{3}$

**Approximate the area under the graph of f(x) and above the x–axis using n rectangles. Use right endpoints.**

70) $f(x) = 2x^3 - 1$ from $x = 1$ to $x = 6$; $n = 5$ 70) _____

A) 875 B) 800

C) 825 D) 850

**Solve the problem. Round your answer, if appropriate.**

71) A certain object moves in such a way that its velocity (in m/s) after time t (in s) is given by

$v = t^2 + 6t + 4$.

Find the distance traveled during the first four seconds by evaluating $\int_0^4 (t^2 + 6t + 4)\,dt$. 71) _____

A) 85.3 m B) 64.0 m

C) 44.0 m D) 69.3 m

**Evaluate the definite integral.**

72) $\int_{-3}^{0} \frac{1}{2}x^3\,dx$ 72) _____

A) $\frac{81}{8}$ B) $\frac{81}{2}$

C) $-\frac{81}{8}$ D) $-\frac{81}{2}$

**Evaluate the definite integral. Round your answer, if necessary.**

73) $\int_1^4 (x^{3/2} + x^{1/2} - x^{-1/2})\,dx$ 73) _____

A) 14.67 B) 14.93

C) 46 D) 15.07

Answer Key
Testname: FINALEXAMPRACTICEFALL06

1) B
2) C
3) C
4) B
5) C
6) A
7) C
8) C
9) A
10) C
11) B
12) A
13) C
14) D
15) A
16) A
17) A
18) A
19) B
20) A
21) A
22) B
23) C
24) C
25) C
26) C
27) C
28) C
29) B
30) C
31) C
32) D
33) C
34) C
35) C
36) D
37) C
38) B
39) A
40) C
41) D
42) D
43) D
44) C
45) D
46) A
47) A
48) A
49) D
50) C
51) C
52) D
53) D
54) B
55) C
56) A
57) A
58) D
59) C
60) C
61) A
62) A
63) C
64) A
65) C
66) B
67) D
68) C
69) B
70) A
71) A
72) C
73) D