Exam

Name_____

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

Differentiate implicitly to find the slope of the curve at the given point.

1) $y^3 + yx^2 + x^2 - 3y^2 = 0$; $(-1, 1)$ 1) _____

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

Find dy/dx by implicit differentiation.

2) $y^3 + 5xy + 4x^3 - 4x = 0$ 2) _____

A) $\frac{4 + 5y - 12x^2}{3y^2 - 5x}$ B) $\frac{4 - 5y - 12x^2}{3y^2 + 5x}$ C) $\frac{4 + 5y - 12x^2}{3y^2 + 5x}$ D) $\frac{4 - 5y - 12x^2}{3y^2 - 5x}$

Solve the problem.

3) A piece of land is shaped like a right triangle. Two people start at the right angle at the same time, and walk at the same speed along different legs of the triangle while spraying the land. If the area covered is changing at 5 m^2/s, how fast are the people moving when they are 2 m from the right angle? (Round approximations to two decimal places.) 3) _____

A) 5.00 m/s B) 2.50 m/s C) 1.25 m/s D) 0.80 m/s

4) A metal cube dissolves in acid such that an edge of the cube decreases by 0.42 mm/min. How fast is the volume of the cube changing when the edge is 8.6 mm? 4) _____

A) -267 mm^3/min B) -31 mm^3/min C) -93 mm^3/min D) -528 mm^3/min

Determine whether the statement is true or false.

5) If $E(p) < 1$ for a particular value of p, an increase in price will bring a decrease in revenue. 5) _____

A) False B) True

6) If demand is inelastic for a particular value of p, an increase in price will bring an increase in revenue. 6) _____

A) False B) True

Solve the problem.

7) The intensity I of an earthquake is given by 7) _____

$$I = I_0\, 10^R,$$

where R = the magnitude on the Richter scale, I_0 is the minimum intensity, and R = 0 is used for comparison. Find I, in terms of I_0 , for an earthquake of magnitude 3.9 on the Richter scale.

A) $0.59 - \log I_0$ B) $39I_0$ C) $7943.3\, I_0$ D) $7943.3\, I_0^{3.9}$

8) Find the general form of the function that satisfies the equation $\frac{dN}{dt} = kN$. 8) _____

A) $N = ce^{kx}$ B) $t = ce^{kN}$ C) $N(t) = ce^{kt}$ D) $k = e^{tc}$

9) Suppose that P_0 is invested in a savings account in which interest is compounded continuously at 5.8% per year. That is, the balance P grows at the rate given by $\frac{dP}{dt} = 0.058P$. Suppose that \$8000 is invested. What is the balance after 2 years? 9) _____

A) \$2245.99 B) \$6737.98 C) \$4491.98 D) \$8983.97

10) The natural resources of an island limit the growth of the population. The population of the island is given by the logistic equation 10) _____

$$P(t) = \frac{3156}{1 + 3.29e^{-0.4t}}$$

where t is the number of years after 1980. What is the limiting value of the population?

A) 25 people B) 736 people C) 3156 people D) 985 people

11) If \$3000 is invested in an account that pays interest compounded continuously, how long will it take to grow to \$9000 at 6%? 11) _____

A) 18.3 years B) 11.0 years C) 18.4 years D) 6.6 years

12) A radioactive substance has a decay rate of 2.6% per minute. Of an initial amount of 1000 g of the substance, how much will remain after 40 minutes? 12) _____

A) 353.5 g B) 318.1 g C) 477.2 g D) 395.9 g

13) Suppose that the amount in grams of a radioactive substance present at time t (in years) is given by $A(t) = 840e^{-0.63t}$. Find the rate of change of the quantity present at the time when $t = 2$. 13) _____

A) 3.5 grams per year B) –150.1 grams per year

C) –3.5 grams per year D) 150.1 grams per year

14) Find the tripling time for an amount invested at a growth rate 4% per year compounded continuously. 14) _____

A) 17.3 years B) 27.5 years C) 30 years D) 4.4 years

15) A beverage company works out a demand function for its sale of soda and finds it to be 15) _____

$$x = D(p) = 3600 - 25p,$$

where x = the quantity of sodas sold when the price per can, in cents, is p. At what price is the revenue a maximum?

A) 80 cents B) 72 cents C) 58 cents D) 144 cents

16) An electronics store determines the following demand function for phones of a particular type 16) _____

$$x = D(p) = \frac{2p + 350}{13p + 15},$$

where x = the number of phones sold per day when the price per phone is p dollars. Find the elasticity when p = $65 per phone.

A) E(p) = 0.57 B) E(p) = 0.71 C) E(p) = 2.55 D) E(p) = 0.97

17) 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: 17) _____

$$V(t) = 300(1 - e^{-.0020t})^3,$$

where t is in months and V(t) is measured in cubic centimeters. Calculate the rate of change of tumor volume at 180 months.

A) 0.18 cm^3/month B) 0.497 cm^3/month

C) 0.084 cm^3/month D) 0.115 cm^3/month

18) A model for advertising response is given by 18) _____

$$N(a) = 10{,}000 + 500 \ln a, \quad a \geq 1$$

where N(a) = the number of units sold and a = the amount spent on advertising, in thousands of dollars. Find N'(2).

A) 347 B) 250 C) 10,250 D) 200

Differentiate.

19) $f(x) = e^{3x}$ 19) _____

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

20) $f(x) = \log_9(x^5 + 1)$ 20) _____

A) $\frac{5x^4}{(x^5 + 1)}$ B) $\frac{1}{(\ln 9)(x^5 + 1)} + 5x^4$

C) $\frac{5(\ln 9)\, x^4}{(x^5 + 1)}$ D) $\frac{5x^4}{(\ln 9)(x^5 + 1)}$

21) $f(x) = x^7 \log_4 x$ 21) _____

A) $(\ln 4)\, x^6 + 7x^6 \log_4 x$ B) $\frac{x^6}{\ln 4} + 7x^6 \log_4 x$

C) $x^6 + 7x^6 \log_4 x$ D) $\frac{7x^5}{\ln 4}$

22) $y = e^{9x^2} + x$ 22) _____

A) $18xe^{x^2} + 1$ B) $18xe^{9x^2} + 1$ C) $18xe + 1$ D) $18xe^{2x} + 1$

Find the derivative.

23) $y = \left(e^{x^3} - 2\right)^6$ 23) _____

A) $6\left(3x^2e^{x^3}\right)^5$ B) $6x^3e^{x^3-1}\left(e^{x^3} - 2\right)^5$

C) $18x^2e^{x^3}\left(e^{x^3} - 2\right)^5$ D) $6\left(e^{x^3} - 2\right)^5$

24) $y = 5x^2e^{3x}$ 24) _____

A) $10xe^{3x}(2x + 3)$ B) $5xe^{3x}(3x + 2)$ C) $10ex^{3x}(3x + 2)$ D) $5xe^{3x}(2x + 3)$

For the given function, find the requested relative extrema or extreme value.

25) $y = x^2e^{3x}$; maximum value on $[-2, 0]$ 25) _____

A) $\frac{4}{9}e^{-2}$ B) 0 C) $\frac{1}{36}e^{1/2}$ D) $\frac{2}{3}e^{-\frac{2}{3}}$

Find the derivative.

26) $y = \frac{6e^x}{2e^x + 1}$ 26) _____

A) $\frac{6e^x}{(2e^x + 1)}$ B) $\frac{e^x}{(2e^x + 1)^2}$ C) $\frac{6e^x}{(2e^x + 1)^3}$ D) $\frac{6e^x}{(2e^x + 1)^2}$

27) $y = e^{x^3} \ln x$ 27) _____

A) $\frac{e^{x^3} + 3e^{x^3} \ln x}{x}$ B) $\frac{3x^3\, e^{x^3} + 1}{x}$

C) $\frac{e^{x^3} + 3x^2\, e^{x^3} \ln x}{x}$ D) $\frac{e^{x^3} + 3x^3\, e^{x^3} \ln x}{x}$

Solve the problem.

28) A CD store determines the following demand function for a particular CD 28) _____

$$x = D(p) = \sqrt{330 - p^2},$$

where x = the number of CDs sold per day when the price per CD is p dollars. At what price is the revenue a maximum? Round your answer to the nearest dollar.

A) \$13 B) \$12 C) \$18 D) \$15

29) A radioactive substance has a decay rate of 3.9% per day. What is its half-life? 29) _____

A) 2.7 days B) 0.18 days C) 17.8 days D) 20.5 days

30) The magnitude R (measured on the Richter scale) of an earthquake of intensity I is defined as 30) _____

$$R = \log \frac{I}{I_0}.$$

where I_0 is a minimum intensity used for comparison. What is the magnitude on the Richter scale of an earthquake whose intensity, I, is $10^{4.9} I_0$?

A) 11.3 B) 4.9 C) 0.7 D) $4.9 I_0$

31) Management at a factory has found that the maximum number of units a worker can produce in a week is given by $P(t) = 55 (1 - e^{-0.3t})$, where t is the number of weeks the worker has been on the job. Find the rate of change $P'(t)$. 31) _____

A) $P'(t) = 16.5 e^{-0.3t}$ B) $P'(t) = 55 (1 + 0.3e^{-0.3t})$

C) $P'(t) = -16.5 e^{-0.3t}$ D) $P'(t) = 55 e^{-0.3t}$

32) The natural resources of an island limit the growth of the population to a limiting value of 3252. The population of the island is given by the logistic equation 32) _____

$$P(t) = \frac{3252}{1 + 4.82e^{-0.38t}},$$

where t is the number of years after 1980. What is the population of the island in 1984?

A) 1504 people B) 757 people C) 1425 people D) 1583 people

33) An amount is invested at a certain growth rate, k, per year compounded continuously. The doubling time is 7 years. What is the growth rate k? 33) _____

A) 4.85% B) 7.39% C) 11.43% D) 9.9%

Differentiate.

34) $f(x) = 2 - e^{-x}$ 34) _____

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

35) $f(x) = x(3.3)^x$ 35) _____

A) $(\ln 3.3)x(3.3)^x$ B) $(3.3)^x + x(3.3)^x$

C) $(3.3)^x + (\ln 3.3)(3.3)^x$ D) $(3.3)^x + (\ln 3.3)x(3.3)^x$

36) $y = 4^x$ 36) _____

A) $(\ln x)4^x$ B) $(\log 4)4^x$ C) $(\ln 4)4^x$ D) 4^x

37) $y = \log_6 x$ 37) _____

A) $\frac{1}{x \ln 6}$ B) $\frac{\ln 6}{x}$ C) $\frac{1}{x \ln x}$ D) $\frac{1}{x \log 6}$

Find the derivative.

38) $y = \sqrt{6e^{3x} + 9}$ 38) _____

A) $\frac{3e^{3x}}{\sqrt{6e^{3x} + 9}}$ B) $\frac{1}{2\sqrt{18e^{3x}}}$ C) $\frac{1}{2\sqrt{6e^{3x} + 9}}$ D) $\frac{9e^{3x}}{\sqrt{6e^{3x} + 9}}$

39) $f(x) = (\ln x)^6$ 39) _____

A) $\frac{1}{(\ln x)^6}$ B) $\frac{6 (\ln x)^5}{x}$ C) $\frac{1}{x^6}$ D) $6 (\ln x)^5$

Find the indicated tangent line.

40) Find the tangent line to the graph of $f(x) = -2e^{8x}$ at the point $(0, -2)$. 40) _____

A) $y = -16x - 2$ B) $y = 16x + 2$ C) $y = 2x + 2$ D) $y = -2x - 2$

41) Find the tangent line to the graph of $f(x) = 4e^{-8x}$ at the point $(0, 4)$. 41) _____

A) $y = 8x - 4$ B) $y = 32x - 4$ C) $y = -32x + 4$ D) $y = 4x + 4$

For the given function, find the requested relative extrema or extreme value.

42) $y = 2xe^x$; minimum value on $[-2, 0]$ 42) _____

A) 0 B) $-4e^2$ C) $-\frac{2}{e}$ D) $\frac{2}{e}$

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

43) $e^{0.08t} = 3$ 43) _____

A) 37.5 B) 5.964 C) 0.088 D) 13.733

44) $e^{-t} = 0.02$ 44) _____

A) −0.007 B) −3.912 C) 3.912 D) −0.054

Find the elasticity of the demand function at the given price and state whether the demand is elastic, inelastic, or whether it has unit elasticity.

45) $q = D(p) = 700e^{-0.03p}$; \$16 45) _____

A) 0.03; inelastic B) 0.48; inelastic C) $\frac{1600}{3}$; elastic D) 1; unit elasticity

46) $q = D(p) = 600 - 5p$; \$85 46) _____

A) $\frac{17}{7}$; elastic B) $\frac{1}{35}$; inelastic C) 175; elastic D) $\frac{7}{17}$; inelastic

Find the value of the expression.

47) Let $\log_b A = 5$ and $\log_b B = -2$. Find $\log_b \sqrt[2]{AB}$. 47) _____

A) −3.162 B) 3.162 C) $2\sqrt{-10}$ D) 1.500

48) Let $\log_b A = 4$ and $\log_b B = -20$. Find $\log_b \frac{A}{B}$. 48) _____

A) −16 B) 24 C) $\frac{1}{5}$ D) $-\frac{1}{5}$

49) Let $\log_b A = 3$ and $\log_b B = -5$. Find $\log_b B^2$. 49) _____

A) 25 B) −10 C) 6 D) −25

Find the derivative of the function.

50) $y = x^7 \ln x - \frac{1}{3}x^3$ 50) _____

A) $x^6 - x^2 + 7x^6 \ln x$ B) $8x^6 - x^2$

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

51) $y = \ln (x - 8)$ 51) _____

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

52) $y = \ln (6 + x^2)$ 52) _____

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

Provide an appropriate response.

53) Which of the following statements regarding the graph of $y = 2^{-x}$ is false? 53) _____

I. The graph lies above the x−axis for all values of x.
II. The graph is decreasing over the entire real number line.
III. The graph is concave down over the entire real number line.
IV. The graph has no critical points.

A) III B) IV C) II D) I

54) Which of the following statements regarding the graph of $y = \log x$ is false? 54) _____

I. The graph lies below the x−axis for $0 < x < 1$.
II. The graph is increasing over the entire real number line.
III. The graph is concave down over the entire real number line.
IV. The domain is $[0, \infty)$.

A) IV B) I C) III D) II

Write an equivalent exponential equation.

55) $\log_{125} 5 = \frac{1}{3}$ 55) _____

A) $125^{1/3} = 5$ B) $5^{1/3} = 125$ C) $5^{125} = 3$ D) $1/3^5 = 125$

Write an equivalent logarithmic equation.

56) $9^{1/2} = 3$ 56) _____

A) $\log_9 3 = 1/2$ B) $\log_3 1/2 = 9$ C) $\log_{1/2} 9 = 3$ D) $\log_3 9 = 1/2$

Find dy/dx by implicit differentiation.

57) $7y^2 - 5x^2 = 5$ 57) _____

A) $\frac{10x + 5}{14y}$ B) $\frac{5x}{7y}$ C) $\frac{5x^2}{14y}$ D) $\frac{5x}{7}$

58) $xy^2 = 4$ 58) _____

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

59) $x^3 + 3x^2y + y^3 = 8$ 59) _____

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) $\frac{x^2 + 2xy}{x^2 + y^2}$

Solve the problem.

60) 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 4 ft/s, how fast is the bottom of the ladder moving along the ground when the bottom is 8 ft from the wall? 60) _____

A) 0.8 ft/s B) 0.50 ft/s C) 3.0 ft/s D) 5.0 ft/s

61) A man flies a kite at a height of 50 m. The wind carries the kite horizontally away from him at a rate of 7 m/sec. How fast is the distance between the man and the kite changing when the kite is 130 m away from him? 61) _____

A) 7.6 m/sec B) 50.5 m/sec C) 6.5 m/sec D) 7 m/sec

62) A rectangular swimming pool 17 m by 10 m is being filled at the rate of 0.6 m^3/min. How fast is the height h of the water rising? 62) _____

A) 0.84 m/min B) 0.20 m/min C) 0.0035 m/min D) 102 m/min

Answer Key
Testname: MATH 125 CH2_7 THROUGH 3_6 TEST

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

51) B
52) D
53) A
54) A
55) A
56) A
57) B
58) C
59) C
60) C
61) C
62) C