MA 15910 Review Worksheet for Exam 3, Spring 2016

Find the derivative of each. (1 – 15)

1) $r(x)=\sqrt{5x^3-4x^2}$

2) $f(x)=6e^{x^2-2x}$

3) $g(x)=x^2e^{1-x}$

4) $y=\dfrac{3x^2}{e^{2x}}$

5) $h(x)=(4e^x+x^3)^4$

6) $k(x)=-3(4x^2+9)^{-3}$

7) $m(x)=3x(2x^5+3)^4$

8) $f(x)=\dfrac{(2x-3)^4}{3x^2+2}$

9) $h(x)=\ln(x^2+2x^4)$ Assume domain only includes values that yield positive arguments.

10) $y=\dfrac{\ln x}{3x+2}$ Assume domain is $(0, \infty)$.

11) $j(x)=\dfrac{\ln x}{\ln 3}$ Assume domain is $(0, \infty)$.

12) $y=x^2(\ln x^2)$

13) $f(x)=\dfrac{\ln(x^2-1)}{x+3}$

14) $g(x)=e^{3x+1}(\ln 3x)$

15) $y=(5x^2+\ln 2x)^4$ for $x>0$

Solve each equation. (16 – 20)

16) $25^{x+2}=125^{3x-5}$

17) $8^{x^2}=2^{x+4}$

18) $\log_6(x+1)=2$

19) $\log(x+5)+\log(x+2)=1$

20) $3^{x+2}=7^x$ Round answer(s) to four decimal places.

21) (a) Convert to exponential form: $\log_b 212=3x$

(b) Convert to logarithmic form: $e^{2x-1}=15$

(c) Convert to logarithmic form: $5^{2-x}=w$

(d) Convert to logarithmic form: $4^{0.5}=2$

22) Use your TI-30XA calculator to approximate $\ln 35.6$ and $e^{2.3}$.

23) Use your calculator and the 'change of base' formula to approximate $\log_3 17$ to four decimal places.

24) Suppose $\log_b 2 = x$ and $\log_b 5 = y$, use the properties of logarithms to express $\log_b 20$ using x and y.

25) Evaluate $\log_4 64$ and $\log_3\left(\frac{1}{9}\right)$ without a calculator.

26) Using the properties of logarithms, express the following as a sum, difference, or product of simpler logarithms. (In other words, expand the logarithm.) Simplify.

$$\log_4\left(\frac{16p}{\sqrt{q}}\right)$$

27) Find the slope of the tangent line and the equation of the tangent line to the graph of $y = xe^x$ at the point where $x = 1$.

Find any open intervals where the following functions are increasing. (28 – 29)

28) $f(x) = 4x^3 + 8x^2 - 16x + 11$

29) $g(x) = \dfrac{15}{2x+7}$

Find the locations (x values) and the values (y values) for all relative maxima and/or relative minima for these functions. (Use a first derivative sign chart.) (30, 31)

30) $f(x) = 2x^3 + 3x^2 - 12x + 5$

31) $g(x) = \dfrac{\ln x}{2x^2}$, $x > 0$

Find the second derivative of each function. (32, 33)

32) $f(x) = 9x^3 + \dfrac{2}{x}$

33) $g(x) = \dfrac{1-2x}{4x+3}$

34) Find the second derivative f'' for the function $f(x) = 2x^2 - 5x^3 + \dfrac{1}{x^2}$. Then find the values of $f''(1)$ and $f''(5)$.

35) If the demand function (price function) for a product is modeled by $p = 56e^{-0.000012x}$ where x is the number of units produced and the price is in dollars. How many units should be produced to achieve maximum revenue? (Write a revenue function first.) What is that maximum revenue?

36) Find any intervals where the function is concave upward. Then, concave downward.

$f(x) = -x^3 - 12x^2 - 45x + 2$

37) For the function $f(x) = -x(x-3)^2$, find the following.

(a) Any relative maximum or relative minimum point(s).

(b) Any point(s) of inflection

38) Suppose the number of bacteria N (in millions) present in the culture at time t (in hours) is given by the function $N(t) = t^3 - 18t^2 + 96t + 1000$. At what hours in the domain (0, 8) will the population of bacteria be maximized? Find that maximum population.

39) The percent of concentration of a drug in the bloodstream x hours after the drug is administered is given by $K(x) = \frac{4x}{3x^2 + 27}$. After how many hours (to the nearest tenth of an hour) will the concentration of the drug in the bloodstream be at a maximum? What is that maximum concentration (to the nearest hundredth of a percent)?

40) If a cannonball is shot directly upward from ground level with a velocity of 256 feet per second, its height above the ground after t seconds is given by $h(t) = 256t - 16t^2$.

(a) Find a function for the velocity of the cannonball. What is the velocity after 2 seconds.

(b) Find the acceleration of the cannonball at any time.

(c) Find the maximum height reached by the cannonball.

(d) Find after how many seconds the cannonball will reach the ground.

41) Find the amount in an account where $10,000 was invested for 6 years at 5.5% interest compounded (a) semiannually and (b) continuously. (c) How much <u>interest</u> would be earned if it was compounded quarterly?

42) Since 1960, the growth of the world population (in millions) closely fits the exponential function, $A(t) = 3100e^{0.0166t}$, where t is the number of years since 1960. World population was about 6115 million in 2000. How closely does the function approximate this value?