MATH 1271 Spring 2013, Midterm #2
Handout date: Thursday 4 April 2013

PRINT YOUR NAME:

PRINT YOUR TA'S NAME:

WHAT RECITATION SECTION ARE YOU IN?

Closed book, closed notes, no calculators/PDAs; no reference materials of any kind. Turn off all handheld devices, including cell phones.

Show work; a correct answer, by itself, may be insufficient for credit. Arithmetic need not be simplified, unless the problem requests it.

I understand the above, and I understand that cheating has severe consequences, from a failing grade to expulsion.

SIGN YOUR NAME:

I. Multiple choice

A. (5 pts) (no partial credit) The Quotient Rule says that $(f/g)'$ is equal to what? Circle one of the following answers:

    (a) f'/g'

    (b) g'/f'

    (c) $(fg' - gf')/g^2$

    (d) $(gf' - fg')/g^2$

    (e) NONE OF THE ABOVE

B. (5 pts) (no partial credit) Compute $[d/dx][\sin^2(xy)]$. Circle one of the following answers:

    (a) $2[\sin(xy)][\cos(xy)]$

    (b) $[\cos^2(xy)][y + xy']$

    (c) $2[\sin(xy)][\cos(xy)][y + xy']$

    (d) $2[\sin(xy)][\cos(y + xy')]$

    (e) NONE OF THE ABOVE

C. (5 pts) (no partial credit) Compute $\lim_{x \to \infty} (2x^2 + 4x - 3)e^{-x}$. Circle one of the following answers:

    (a) 0

    (b) -3

    (c) ∞

    (d) 2

    (e) NONE OF THE ABOVE

D. (5 pts) (no partial credit) Let f be a function such that $f'(x) = 3e^{4x-4}$. Suppose, also, that $f(1) = 5$. Which of the following is an equation of the tangent line to the graph of f at $(1,5)$. Circle one of the following answers:

(a) $y = 1 + 3(x - 5)$

(b) $y = 5 + 3(x - 1)$

(c) $y = 1 + 3e^{4x-4}(x - 5)$

(d) $y = 5 + 3e^{4x-4}(x - 1)$

(e) NONE OF THE ABOVE

E. (5 pts) (no partial credit) Suppose $f'(x) = (x - 1)^8(x - 2)^6(x - 3)^5$. Which of the following is a maximal interval of increase for f? Circle one of the following answers:

(a) $[2, \infty)$

(b) $(-2, \infty)$

(c) $[1, \infty)$

(d) $(-\infty, 1]$

(e) NONE OF THE ABOVE

F. (5 pts) (no partial credit) Compute $\dfrac{d}{dx} \left[\ln |(2x + 1)(3x - 4)| \right]$. Circle one of the following answers:

(a) $\dfrac{2}{2x + 1} + \dfrac{3}{3x - 4}$

(b) $\left| \dfrac{2}{2x + 1} + \dfrac{3}{3x - 4} \right|$

(c) $\dfrac{6}{(2x + 1)(3x + 4)}$

(d) $\left| \dfrac{6}{(2x + 1)(3x + 4)} \right|$

(e) NONE OF THE ABOVE

II. True or false (no partial credit):

a. (5 pts) Let f and g be any two functions such that $\lim_{x \to a} [f(x)] = \infty$ and $\lim_{x \to a} [g(x)] = \infty$. Then $\lim_{x \to a} [(f(x)) - (g(x))] = 0$.

b. (5 pts) Let g be any function such that $\lim_{x \to \infty} [g(x)] = \infty$. Then $\lim_{x \to \infty} [(1/x)^{g(x)}] = 0$.

c. (5 pts) If f is increasing on an interval I, then $f' > 0$ on I.

d. (5 pts) Let f and g be any two functions such that $\lim_{x \to 5} f(x) = 0$ and $\lim_{x \to 5} g(x) = \infty$. Then $\lim_{x \to 5} \dfrac{f(x)}{g(x)} = 0$.

e. (5 pts) Let u be any expression of x. Then $(d/dx)(e^u) = e^u (du/dx)$.

III. Computations. Show work. Unless otherwise specified, answers must be exactly correct, but can be left in any form easily calculated on a standard calculator.

1. (5 pts) Compute $\dfrac{d}{dx}\left[\dfrac{e^{-x^3}}{4 + \tan(x^2)}\right]$. (Here e^{-x^3} means $e^{\left(-x^3\right)}$.)

2. (5 pts) Compute $\dfrac{d}{dx}\left[(2 + \sin x)^{3-x}\right]$.

3. (10 pts) Find an equation for the tangent line to $5x^3 - 2xy + y^2 = 5x + y$ at $(1, 3)$.

4. (10 pts) Compute $\lim_{x \to 0} (e^x - 4\sin x)^{5/x}$.

5. Let $y = x^4$. Then $\triangle y = px^3(\triangle x) + qx^2(\triangle x)^2 + rx(\triangle x)^3 + s(\triangle x)^4$, for some real numbers p, q, r, s.

a. (5 pts) Compute p, q, r and s.

b. (5 pts) Assuming $\triangle x \neq 0$, compute $\dfrac{\triangle y}{\triangle x}$.

c. (5 pts) Compute $\lim\limits_{\triangle x \to 0} \dfrac{\triangle y}{\triangle x}$.