MATH 1271 Spring 2014, Midterm #1
Handout date: Thursday 27 February 2014
Instructor: Scot Adams

PRINT YOUR NAME:

PRINT YOUR X.500 ID:

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. Multiple choice

A. (5 pts) (no partial credit) Compute $[d/dx][2e^3 + 5\sin x]$. Circle one of the following answers:

(a) $5\cos x$

(b) $-5\cos x$

(c) $6e^2 + 5\cos x$

(d) $6e^3 + 5\cos x$

(e) NONE OF THE ABOVE

B. (5 pts) (no partial credit) Compute $\left[\dfrac{d}{dx}\right]\left[\dfrac{e^x}{x^4 - 8x}\right]$. Circle one of the following answers:

(a) $\dfrac{(e^x)(4x^3 - 8) - (x^4 - 8x)(e^x)}{(x^4 - 8x)^2}$

(b) $\dfrac{(x^4 - 8x)(e^x) - (e^x)(4x^3 - 8)}{(x^4 - 8x)^2}$

(c) $\dfrac{xe^{x-1}}{4x^3 - 8}$

(d) $\dfrac{e^x}{4x^3 - 8}$

(e) NONE OF THE ABOVE

C. (5 pts) (no partial credit) Which is the intuitive definition of $\lim_{x\to\infty}(f(x)) = -\infty$? Circle one of the following answers:

(a) If x is very positive, then $f(x)$ is very negative.

(b) If x is very negative, then $f(x)$ is very positive.

(c) If $f(x)$ is very negative, then x is very positive.

(d) If $f(x)$ is very positive, then x is very negative.

(e) NONE OF THE ABOVE

D. (5 pts) (no partial credit) Compute $\triangle(x^3 - x^2)$. Circle one of the following answers:

(a) $3x^2 - 2x$

(b) $3x^2 + 3x(\triangle x) + (\triangle x)^2 - 2x - (\triangle x)$

(c) $3x^2(\triangle x) + 3x(\triangle x)^2 + (\triangle x)^3 - 2x(\triangle x)$

(d) $(3x^2 - 2x)\,(\triangle x)$

(e) NONE OF THE ABOVE

E. (5 pts) (no partial credit) Let $f(t) = \tan^2 t$. Compute $f'(\pi/4)$.
(Hint: $f(t) = (\tan\, t)(\tan\, t)$.) Circle one of the following answers:

(a) $-\sqrt{2}/2$

(b) -1

(c) 1

(d) 4

(e) NONE OF THE ABOVE

F. (5 pts) (no partial credit) Let $g(x) = [8 - 3x]\left[\dfrac{x-5}{x-5}\right]$. What is the largest $\delta > 0$ such that $0 < |x - 5| < \delta \quad \Rightarrow \quad |(g(x)) + 7| < 0.6$? Circle one of the following answers:

(a) 0.3

(b) -0.3

(c) 1.8

(d) 0.2

(e) NONE OF THE ABOVE

II. True or false (no partial credit):

a. (5 pts) $\dfrac{d}{dx}\left[\dfrac{\sin x}{x^2}\right] = \dfrac{\cos x}{2x}$.

b. (5 pts) If f and g are both differentiable at 3, then $2f^9g^8$ is also differentiable at 3.

c. (5 pts) If P is any polynomial of degree 5 and Q is any polynomial of degree 3, then $\lim_{x\to-\infty}\left[\dfrac{P(x)}{Q(x)}\right] = \infty$.

d. (5 pts) $\lim_{x\to 0}\dfrac{1-\cos x}{x} = 0$.

e. (5 pts) Let f and g be any two functions such that $f'(5) = 50$ and $g'(3) = 30$. Then $(f-g)'(2) = 20$.

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PLEASE DO NOT WRITE BELOW THE LINE

VERSION D

I. A,B,C

I. D,E,F

II. a,b,c,d,e

III. 1

III. 2

III. 3ab

III. 4abc

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. (10 pts) Compute $\dfrac{d}{dx}\left[\dfrac{(2x^3+x)(4+7e^x)}{\cot x}\right]$.

2. (10 pts) Compute $\lim_{x \to 0} \left[\dfrac{(\sin^2(4x))(\tan x)}{(\sin(2x))(\cos(3x))(3x^5 - 2x^4 - 4x^2)} \right]$.

3. Let $f(x) = -x^6 + 6x^4 + (\tan(e))$.

a. (5 pts) Find all $a \in \mathbb{R}$ such that the graph of f has a horizontal tangent line at $(a, f(a))$.

b. (5 pts) Find all the maximal intervals on which f' is negative.

4. Let $y = 3x^3 - 5x$. Then $\triangle y = ax^2(\triangle x) + bx(\triangle x)^2 + c(\triangle x)^3 + k(\triangle x)$, for some real numbers a, b, c, k.

a. (5 pts) Compute a, b, c and k.

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

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