MATH 1271 Fall 2013, Midterm #1
Handout date: Thursday 10 October 2013

PRINT YOUR NAME:

SOLUTIONS
Version B

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) Compute $\lim_{x \to 0} \left[\frac{x^5 + 2x^3 + 4x^2}{-2x^4 - 7x^2} \right]$. Circle one of the following answers:

$\frac{4}{-7}$

(a) 1/2

(b) $-1/2$

(c) 4/7

(d) $-4/7$

(e) NONE OF THE ABOVE

B. (5 pts) (no partial credit) What is the smallest number x such that $|x + 3| \leq 0.002$? Circle one of the following answers:

$-3 - 0.002$

(a) -2.998

(b) 3

(c) -3.002

(d) 2.998

(e) NONE OF THE ABOVE

C. (5 pts) (no partial credit) Which is the intuitive definition of $\lim_{x \to 8}(H(x)) = 4$? Circle one of the following answers:

(a) If x is close to 8, but not equal to 8, then $H(x)$ is close to 4.

(b) If x is close to 8, then $H(x)$ is close to 4.

(c) If x is close to 8, but not equal to 8, then $H(x)$ is close to 4, but not equal to 4.

(d) If x is close to 8, then $H(x)$ is close to 4, but not equal to 4.

(e) NONE OF THE ABOVE

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

(a) $2xe^{x-1} + 5e$

(b) $2e^x + 5e$

(c) $2e^x + 5$

(d) $2xe^{x-1}$

(e) NONE OF THE ABOVE

$\| \quad 2e^x + 0$

E. (5 pts) (no partial credit) Compute $[d/dx][3x^4 + 2x^{1/2} - \pi]$. Circle one of the following answers:

(a) $4x^3 + x^{-1/2} - \pi$

(b) $12x^3 + x^{-1/2} - \pi$

(c) $12x^3 + x^{-1/2}$

(d) $3x^3 + x^{-1/2}$

(e) NONE OF THE ABOVE

$\| \quad 12x^3 + x^{-1/2} - 0$

F. (5 pts) (no partial credit) Compute $[d/dx][(\sin x)(\cos x)]$. Circle one of the following answers:

(a) $(\cos x)(-\sin x)$

(b) $(\cos x)(\sin x)$

(c) $(\sin^2 x) - (\cos^2 x)$

(d) $(\cos^2 x) - (\sin^2 x)$

(e) NONE OF THE ABOVE

$\| \text{ PR}$

$(\cos x)(\cos x) + (\sin x)(-\sin x)$

II. True or false (no partial credit):

a. (5 pts) If f is a polynomial of degree 7, then f'' is a polynomial of degree 5.

True

b. (5 pts) $\lim_{x \to 0} \frac{\sin x}{x} = 1$.

True

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

False

d. (5 pts) If two functions have the same derivative, then they must be equal.

False

e. (5 pts) If f and g are continuous at 3, then fg MUST be continuous at 3 as well.

True

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PLEASE DO NOT WRITE BELOW THE LINE

VERSION B

I. A,B,C

I. D,E,F

II. a,b,c,d,e

III. 1

III. 2

III. 3

III. 4

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

$$\frac{d}{dx}\left[\frac{(x^3+4)(\tan x)}{1-e^x}\right].$$

$$=$$

$$\frac{[1-e^x][(3x^2)(\tan x)+(x^3+4)(\sec^2 x)]-[(x^3+4)(\tan x)][-e^x]}{[1-e^x]^2}$$

2. (15 pts) Compute $\lim_{n\to\infty}\left(1-\frac{0.05}{n}\right)^n$.

$x = -\frac{n}{0.05}$

$$\lim_{x\to\infty}\left[\left(1+\frac{1}{x}\right)^{(-0.05)x}\right]$$

$$\left(\lim_{x\to\infty}\left[\left(1+\frac{1}{x}\right)^{x}\right]\right)^{-0.05}$$

$$e^{-0.05}$$

3. (10 pts) Find all horizontal asymptotes to

$$y = \frac{\sqrt{4x^2 - 2x + 7}}{2x^2 - 3} := f(x)$$

(NOTE: A horizontal asymptote is a line; your answers should be equations of lines, **NOT** numbers.)

$$\lim_{x \to \pm\infty} f(x) = \lim_{x \to \pm\infty} \frac{\sqrt{4x^2}}{2x^2} = \lim_{x \to \pm\infty} \frac{|2x|}{2x^2}$$

$$= \lim_{x \to \pm\infty} \frac{\pm 2x}{2x^2} = 0$$

$$y = 0$$

4. (10 pts) Suppose $f(0) = 3$ and $f'(0) = 4$. Suppose $g(0) = 5$ and $g'(0) = 6$. Let $h = fg$. Compute $h(0)$ and $h'(0)$.

$$h = fg$$

$$h' = f'g + fg'$$

$$h(0) = 3 \cdot 5 = 15$$

$$h'(0) = 4 \cdot 5 + 3 \cdot 6 = 20 + 18 = 38$$