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

PRINT YOUR NAME:

SOLUTIONS
Version A

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) 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, but not equal to 4.

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

(c) If $H(x)$ is close to 4, then x is close to 8, but greater than 8.

(d) If x is close to 8, but greater than 8, then $H(x)$ is close to 4.

(e) NONE OF THE ABOVE

B. (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) $(\cos^2 x) - (\sin^2 x)$

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

(e) NONE OF THE ABOVE

C. (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) $12x^3 + x^{1/2} + \pi$

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

(e) NONE OF THE ABOVE

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

$2e^x + 0$

(a) $2e^x + 5$

(b) $2e^x$

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

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

(e) NONE OF THE ABOVE

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

$-3 + 0{,}002$

(a) 3

(b) -2.998

(c) 3.002

(d) 2.998

(e) NONE OF THE ABOVE

F. (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) 4/7

(b) $-4/7$

(c) 1/2

(d) $-1/2$

(e) NONE OF THE ABOVE

II. True or false (no partial credit):

a. (5 pts) If f and g are continuous at 4, then $f - g$ MUST be continuous at 4 as well.

True

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

False

c. (5 pts) $\lim_{x \to 4\pi} \frac{\sin x}{x} = 1$.

False

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

False

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

True

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PLEASE DO NOT WRITE BELOW THE LINE

VERSION A

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

$$\frac{d}{dx}\left[\frac{(x^2+3x)(\sin x)}{1+e^x}\right].$$

$$\frac{[1+e^x][(2x+3)(\sin x)+(x^2+3x)(\cos x)]-[(x^2+3x)(\sin x)][e^x]}{[1+e^x]^2}$$

2. (15 pts) Compute $\lim_{n\to\infty}\left(1+\frac{0.045}{n}\right)^n$.

$x = \frac{n}{0.045}$

$$= \lim_{x\to\infty}\left[\left(1+\frac{1}{x}\right)^{(0.045)x}\right]$$

$$= \left(\lim_{x\to\infty}\left[\left(1+\frac{1}{x}\right)^{x}\right]\right)^{0.045}$$

$$= e^{0.045}$$

3. (10 pts) Find all horizontal asymptotes to

$$y = \frac{\sqrt{9x^2 + 2x + 5}}{2x - 3} := : f(x)$$

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

$$\lim_{x \to \pm\infty} f(x) = \lim_{x \to \pm\infty} \frac{\sqrt{9x^2}}{2x} = \lim_{x \to \pm\infty} \frac{|3x|}{2x}$$

$$= \lim_{x \to \pm\infty} \frac{\pm 3x}{2x} = \pm \frac{3}{2}$$

$y = -\frac{3}{2}$ and $y = \frac{3}{2}$

4. (10 pts) Suppose $f(0) = 2$ and $f'(0) = 3$. Suppose $g(0) = 4$ and $g'(0) = 5$. Let $h = fg$. Compute $h(0)$ and $h'(0)$.

$$h = fg$$

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

$$h(0) = 2 \cdot 4 = 8$$

$$h'(0) = 3 \cdot 4 + 2 \cdot 5 = 12 + 10 = 22$$