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

PRINT YOUR NAME:

SOLUTIONS
Version C

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 $[d/dx][3x^4 + 4x^{1/2} - \pi]$. Circle one of the following answers:

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

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

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

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

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

(e) NONE OF THE ABOVE

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

$\| PR \quad (\cos x)(\tan x) + (\sin x)(\sec^2 x)$

(a) $(\cos x)(\sec x)(\tan x)$

(b) $(\cos x)(\sec^2 x)$

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

(d) $(\cos x)(\tan x) + (\sin x)(\sec x)(\tan x)$

(e) NONE OF THE ABOVE

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

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

(a) $2e^x + 5$

(b) $2e^x$

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

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

(e) NONE OF THE ABOVE

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

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

(e) NONE OF THE ABOVE

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E. (5 pts) (no partial credit) Compute $\lim_{x \to -\infty} \left[ \frac{x^4 + 2x^3 - 4x^2}{2x^4 - 7x^2} \right]$. Circle one of the following answers:

(a) $-4/7$

(b) $4/7$

(c) $-1/2$

(d) $1/2$

(e) NONE OF THE ABOVE

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

(a) $-2.998$

$3+0.002$

(b) 3

(c) 3.002

(d) 2.998

(e) NONE OF THE ABOVE

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II. True or false (no partial credit):

a. (5 pts) If $f$ and $g$ are continuous at 3, then $f^2 + g^2$ MUST be continuous at 3 as well.

True

b. (5 pts) $\frac{d}{dx}\left(3\left[f(x)\right] - 2\left[g(x)\right]\right) = 3\left[f'(x)\right] - 2\left[g'(x)\right]$.

True

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

False

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

True

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

False

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PLEASE DO NOT WRITE BELOW THE LINE

VERSION C

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

$$\frac{d}{dx}\left[\frac{(x^5+3x)(\cot x)}{2+e^x}\right].$$

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$$\frac{[2+e^x][(5x^4+3)(\cot x)+(x^5+3x)(-\csc^2 x)]-[(x^5+3x)(\cot x)][e^x]}{[2+e^x]^2}$$

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

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

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

$$\Big\|$$

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

$$\Big\|$$

$$e^{-0.045}$$

3. (10 pts) Find all horizontal asymptotes to

$$y = \frac{\sqrt{x^4 + 4x - 7}}{3x^2 + 5} =: f(x)$$

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

$$\lim_{x \to \pm\infty} f(x) = \lim_{x \to \pm\infty} \frac{\sqrt{x^4}}{3x^2} = \lim_{x \to \pm\infty} \frac{|x^2|}{3x^2}$$

$$= \lim_{x \to \pm\infty} \frac{x^2}{3x^2} = \frac{1}{3}$$

$$y = \frac{1}{3}$$

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

$$h = fg$$

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

$$h(0) = 5 \cdot 2 = 10$$

$$h'(0) = 4 \cdot 2 + 5 \cdot 3 = 8 + 15 = 23$$