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

PRINT YOUR NAME:

SOLUTIONS
Version D

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 $\lim_{x\to-\infty}\left[\frac{x^8+2x^3-4x^2}{2x^4-7x^2}\right]$. Circle one of the following answers:

(a) 1/2

(b) $-1/2$

(c) ∞

(d) $-\infty$

(e) NONE OF THE ABOVE

$\| \lim_{x\to-\infty} \frac{x^8}{2x^4} = \lim_{x\to-\infty} \frac{1}{2}x^4$

"$\frac{1}{2}(-\infty)^4 = \infty$"

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

(a) $(\cos x)(xe^{x-1})$

(b) $(\cos x)e^x$

(c) $(\cos x)e^x + (\sin x)e^x$

(d) $(\cos x)e^x + (\sin x)(xe^{x-1})$

(e) NONE OF THE ABOVE

$\|$PR

$(\cos x)e^x + (\sin x)e^x$

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

(a) If $H(x)$ is very positive, then x is close to 8.

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

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

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

(e) NONE OF THE ABOVE

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

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

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

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

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

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

(e) NONE OF THE ABOVE

E. (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

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

$2e^x + 0$

(a) $2e^x + 5$

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

(c) $2e^x + 5\pi$

(d) $2xe^{x-1} + 5\pi$

(e) NONE OF THE ABOVE

II. True or false (no partial credit):

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

False

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

True

c. (5 pts) $\lim_{x\to 0} \frac{\sin^2 x}{x^2} = 1$.

True

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 f^2g^3 MUST be continuous at 3 as well.

True

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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. 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

$$\frac{d}{dx}\left(\left[\frac{x^2}{1+e^x}\right][5+\sin x]\right).$$

$$\Big\Vert$$

$$\left[\frac{(1+e^x)(2x)-(x^2)(e^x)}{(1+e^x)^2}\right][5+\sin x]+\left[\frac{x^2}{1+e^x}\right][\cos x]$$

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

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

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

$$\Big\|$$

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

$$\Big\|$$

$$e^{0.05}$$

3. (10 pts) Find all horizontal asymptotes to

$$y = \frac{\sqrt{4x^6 + 4x + 4}}{9x^3 + 4} =: f(x)$$

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

$$\lim_{x \to \pm\infty} f(x) = \lim_{x \to \pm\infty} \frac{\sqrt{4x^6}}{9x^3} = \lim_{x \to \pm\infty} \frac{|2x^3|}{9x^3}$$

$$= \lim_{x \to \pm\infty} \frac{\pm 2x^3}{9x^3} = \pm \frac{2}{9}$$

$y = -\frac{2}{9}$ and $y = \frac{2}{9}$

4. (10 pts) Suppose $f(0) = 4$ and $f'(0) = 7$. Suppose $g(0) = 3$ and $g'(0) = 5$. Let $h = fg$. Compute $h(0)$ and $h'(0)$.

$$h = fg$$

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

$$h(0) = 4 \cdot 3 = 12$$

$$h'(0) = 7 \cdot 3 + 4 \cdot 5 = 21 + 20 = 41$$