MATH 1271 Fall 2012, Midterm #1
Handout date: Thursday 4 October 2012

PRINT YOUR NAME:

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 $\lim_{h\to 0}\left[\dfrac{\sqrt{9+h}-\sqrt{9+4h}}{3h}\right]$. Circle one of the following answers:

(a) $-1/6$

(b) $1/6$

(c) $1/9$

(d) This limit does not exist.

(e) NONE OF THE ABOVE

B. (5 pts) (no partial credit) Compute $\lim_{x\to 0}\left[\dfrac{3x^4+2x^3}{7x(\sin^2 x)}\right]$. Circle one of the following answers:

(a) $5/7$

(b) $2/7$

(c) 0

(d) ∞

(e) NONE OF THE ABOVE

C. (5 pts) (no partial credit) Compute $\lim_{x\to 0}\left[\dfrac{x^3+2x^2-4x}{\sin(8x)}\right]$ Circle one of the following answers:

(a) $2/3$

(b) $-1/2$

(c) $1/2$

(d) $-2/3$

(e) NONE OF THE ABOVE

D. (5 pts) (no partial credit) Compute $\lim_{x \to -\infty} \left[\frac{\sqrt{16x^6 - x}}{16x^3 + x} \right]$. Circle one of the following answers:

(a) 1/4

(b) 1/2

(c) $-1/4$

(d) $-1/2$

(e) NONE OF THE ABOVE

E. (5 pts) (no partial credit) Compute $\lim_{t \to 3} \left[\frac{t^2 + t - 12}{t - 3} \right]$. Circle one of the following answers:

(a) 3

(b) 4

(c) 5

(d) 6

(e) NONE OF THE ABOVE

F. (5 pts) (no partial credit) Which is the intuitive definition of $\lim_{x \to 3}(g(x)) = 8$? Circle one of the following answers:

(a) If x is close to 3, but not equal to 3, then $g(x)$ is close to 8.

(b) If x is close to 3, but not equal to 3, then $g(x)$ is close to 8, but not equal to 8.

(c) If $g(x)$ is close to 8, but not equal to 8, then x is close to 3.

(d) If $g(x)$ is close to 3, then x is close to 8.

(e) NONE OF THE ABOVE

II. True or false (no partial credit):

a. (5 pts) Let $f(x) = |x|$. Then f is continuous at every real number.

b. (5 pts) Let $f(x) = |x|$. Then the domains of f and of f' are equal.

c. (5 pts) For every $x < 0$, $\sqrt{x^4} = -x^2$.

d. (5 pts) Let $f(x) = x^4$. Then f is a one-to-one function.

e. (5 pts) If a function f is differentiable at a number a, then f is continuous at a.

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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) Find all horizontal asymptotes to

$$y = \frac{\sqrt{9x^2 + 2x + 5}}{4x - 3}.$$

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

2. (15 pts) Draw a single graph showing a function $f : [2, 4] \to \mathbb{R}$ with *all* of the following properties:

- (•) Its domain is the interval $[2, 4]$.
- (•) It is continuous on $[2, 4]$.
- (•) It is differentiable on $(2, 3)$ and on $(3, 4)$.
- (•) For all $x \in (2, 3)$, we have: $f'(x) = -1$.
- (•) For all $x \in (3, 4)$, we have: $f'(x) = 1$.
- (•) It is not differentiable at 3.
- (•) $f(3) = 0$.

3. (10 pts) Compute $\lim_{x\to\infty}\left[\dfrac{x^2+\sin^2 x}{2x^2+1}\right]$.

4. (10 pts) Let $f(x) = -(x+1)^4(x-2)^3(x-5)$. Find all of the maximum intervals of positivity and negativity for f.