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

(a) 0

(b) ∞

(c) 5/7

(d) 2/7

(e) NONE OF THE ABOVE

B. (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) $-1/4$

(c) 1/2

(d) $-1/2$

(e) NONE OF THE ABOVE

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

(e) NONE OF THE ABOVE

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

(a) 3

(b) 4

(c) 5

(d) 6

(e) NONE OF THE ABOVE

E. (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

F. (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

II. True or false (no partial credit):

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

b. (5 pts) Let $f(x) = x^3$. Then f is a one-to-one function.

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

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

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

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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) Find all horizontal asymptotes to

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

(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 $f : [3, 5] \to \mathbb{R}$ with *all* of the following properties:

- (•) Its domain is the interval $[3, 5]$.
- (•) It is continuous on $[3, 5]$.
- (•) It is differentiable on $(3, 4)$ and on $(4, 5)$.
- (•) For all $x \in (3, 4)$, we have: $f'(x) = -1$.
- (•) For all $x \in (4, 5)$, we have: $f'(x) = 1$.
- (•) It is not differentiable at 4.
- (•) $f(4) = 0$.

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

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