

MATH 1271 Spring 2014, Midterm #1  
Handout date: Thursday 27 February 2014  
Instructor: Scot Adams

PRINT YOUR NAME:

PRINT YOUR X.500 ID:

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. Multiple choice

A. (5 pts) (no partial credit) Let  $f(t) = \cot^2 t$ . Compute  $f'(\pi/4)$ . (Hint:  $f(t) = (\cot t)(\cot t)$ .) Circle one of the following answers:

- (a) 1
  - (b)  $-\sqrt{2}/2$
  - (c)  $-4$
  - (d)  $-1$
  - (e) NONE OF THE ABOVE
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B. (5 pts) (no partial credit) Compute  $[d/dx][2e^3 + 5 \sin x]$ . Circle one of the following answers:

- (a)  $6e^2 + 5 \cos x$
  - (b)  $6e^3 + 5 \cos x$
  - (c)  $-5 \cos x$
  - (d)  $5 \cos x$
  - (e) NONE OF THE ABOVE
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C. (5 pts) (no partial credit) Which is the intuitive definition of  $\lim_{x \rightarrow -\infty} (f(x)) = \infty$ ? Circle one of the following answers:

- (a) If  $x$  is very negative, then  $f(x)$  is very positive.
- (b) If  $x$  is very positive, then  $f(x)$  is very negative.
- (c) If  $f(x)$  is very positive, then  $x$  is very negative.
- (d) If  $f(x)$  is very negative, then  $x$  is very positive.
- (e) NONE OF THE ABOVE

D. (5 pts) (no partial credit) Compute  $\left[\frac{d}{dx}\right] \left[\frac{e^x}{x^4 - 8x}\right]$ . Circle one of the following answers:

(a)  $\frac{(x^4 - 8x)(e^x) - (e^x)(4x^3 - 8)}{\sqrt{x^4 - 8x}}$

(b)  $\frac{(x^4 - 8x)(e^x) - (e^x)(4x^3 - 8)}{x^4 - 8x}$

(c)  $\frac{e^x}{4x^3 - 8}$

(d)  $\frac{xe^{x-1}}{4x^3 - 8}$

(e) NONE OF THE ABOVE

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E. (5 pts) (no partial credit) Compute  $\Delta(x^3 - x^2)$ . Circle one of the following answers:

(a)  $3x^2(\Delta x) + 3x(\Delta x)^2 + (\Delta x)^3 - 2x(\Delta x) - (\Delta x)^2$

(b)  $3x^2 - 2x$

(c)  $(3x^2 - 2x)(\Delta x)$

(d)  $3x^2 + 3x(\Delta x) + (\Delta x)^2 - 2x - (\Delta x)$

(e) NONE OF THE ABOVE

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F. (5 pts) (no partial credit) Let  $g(x) = [8 - 3x] \left[\frac{x - 5}{x - 5}\right]$ . What is the largest  $\delta > 0$  such that  $0 < |x - 5| < \delta \Rightarrow |(g(x)) + 7| < 0.6$ ? Circle one of the following answers:

(a) 0.3

(b) -0.3

(c) 0.2

(d) 1.8

(e) NONE OF THE ABOVE

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II. True or false (no partial credit):

a. (5 pts) If  $P$  is any polynomial of degree 3 and  $Q$  is any polynomial of degree 2, then

$$\lim_{x \rightarrow -\infty} \left[ \frac{P(x)}{Q(x)} \right] = -\infty.$$

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

c. (5 pts) If  $f$  and  $g$  are both differentiable at 3, then  $f^2g - f$  is also differentiable at 3.

d. (5 pts) Let  $f$  and  $g$  be any two functions such that  $f'(4) = 10$  and  $g'(4) = 20$ . Then  $(f + g)'(4) = 30.$

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

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THE BOTTOM OF THIS PAGE IS FOR TOTALING SCORES  
PLEASE DO NOT WRITE BELOW THE LINE

VERSION B

I. A,B,C

I. D,E,F

II. a,b,c,d,e

III. 1

III. 2

III. 3ab

III. 4abc

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  $\frac{d}{dx} \left[ \frac{(2x^2 + 8x)(\csc x)}{5 + e^x} \right]$ .

2. (10 pts) Compute  $\lim_{x \rightarrow 0} \left[ \frac{(\sin(3x))(\cos(2x))(3x^5 - 4x^4 - 2x^2)}{x(\sec(-x))(\tan^2 x)} \right]$ .

3. Let  $f(x) = -3x^5 + 5x^3 + 2e^7$ .

a. (5 pts) Find all  $a \in \mathbb{R}$  such that the graph of  $f$  has a horizontal tangent line at  $(a, f(a))$ .

b. (5 pts) Find all the maximal intervals on which  $f'$  is negative.

4. Let  $y = 2x^3 - x$ . Then  $\Delta y = ax^2(\Delta x) + bx(\Delta x)^2 + c(\Delta x)^3 + k(\Delta x)$ , for some real numbers  $a, b, c, k$ .

a. (5 pts) Compute  $a, b, c$  and  $k$ .

b. (5 pts) Assuming  $\Delta x \neq 0$ , compute  $\frac{\Delta y}{\Delta x}$ .

c. (5 pts) Compute  $\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$ .