

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) Compute $[d/dx][2e^3 + 5 \sin x]$. Circle one of the following answers:

- (a) $-5 \cos x$
 - (b) $6e^2 + 5 \cos x$
 - (c) $6e^3 + 5 \cos x$
 - (d) $2e^3 + 5 \cos x$
 - (e) NONE OF THE ABOVE
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B. (5 pts) (no partial credit) Compute $\Delta(x^3 - x^2)$. Circle one of the following answers:

- (a) $3x^2 + 3x(\Delta x) + (\Delta x)^2 - 2x - (\Delta x)$
 - (b) $(3x^2 - 2x)(\Delta x)$
 - (c) $3x^2 - 2x$
 - (d) $3x^2(\Delta x) + 3x(\Delta x)^2 + (\Delta x)^3 - 2x(\Delta x) - (\Delta x)^2$
 - (e) NONE OF THE ABOVE
-

C. (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) $\frac{(e^x)(4x^3 - 8) - (x^4 - 8x)(e^x)}{(x^4 - 8x)^2}$
- (b) $\frac{(x^4 - 8x)(e^x) - (e^x)(4x^3 - 8)}{(x^4 - 8x)^2}$
- (c) $\frac{xe^{x-1}}{4x^3 - 8}$
- (d) $\frac{e^x}{4x^3 - 8}$
- (e) NONE OF THE ABOVE

D. (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) 0.2
 - (b) -0.2
 - (c) 1.8
 - (d) -0.3
 - (e) NONE OF THE ABOVE
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E. (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 $f(x)$ is very negative, then x is very positive.
 - (b) If $f(x)$ is very positive, then x is very negative.
 - (c) If x is very positive, then $f(x)$ is very negative.
 - (d) If x is very negative, then $f(x)$ is very positive.
 - (e) NONE OF THE ABOVE
-

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

- (a) 4
 - (b) -1
 - (c) $-\sqrt{2}/2$
 - (d) 1
 - (e) NONE OF THE ABOVE
-

II. True or false (no partial credit):

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

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

c. (5 pts) If P is any polynomial of degree 4 and Q is any polynomial of degree 3, then $\lim_{x \rightarrow \infty} \left[\frac{P(x)}{Q(x)} \right] = \infty$.

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

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

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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. 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 $\frac{d}{dx} \left[\frac{(3x^2 + 4)(\cot x)}{2 + e^x} \right]$.

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

3. Let $f(x) = x^6 - 6x^4 - e^{-3}$.

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 $y = -2x^3 + 2x$. 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 $\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$.