

Mathematics 151A
Second Midterm, November 5, 2008

Name: _____

Recitation Instructor and time: _____

This exam has 8 questions, for a total of 40 points on 8 pages.

Please read the problems carefully. Please show your work. Your solutions must be supported by computations and/or explanations: no points will be given for answers that are not accompanied by supporting work.

NO CALCULATORS.

Problem #	Points	Score
1	6	
2	8	
3	3	
4	4	
5	3	
6	6	
7	5	
8	5	
Total	40	

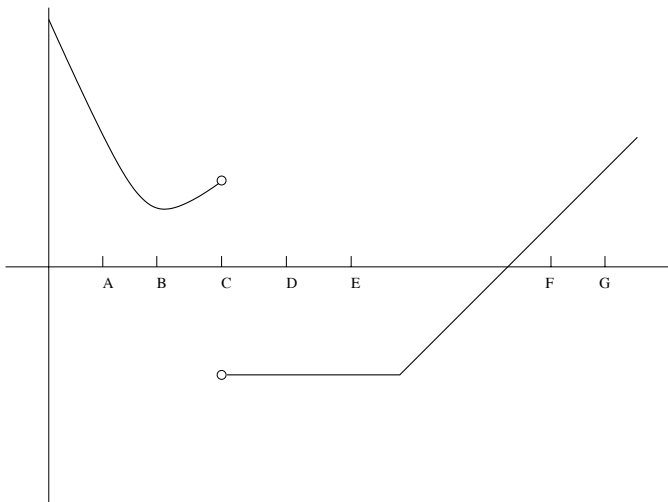
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1. (a) (3 points) Give the formal definition of the derivative of a function $f(x)$ as a limit.

- (b) (3 points) Explain, in English, the meaning of the derivative of $f(x)$. Use words in your answers, NOT formulas, and write your answers as whole sentences.

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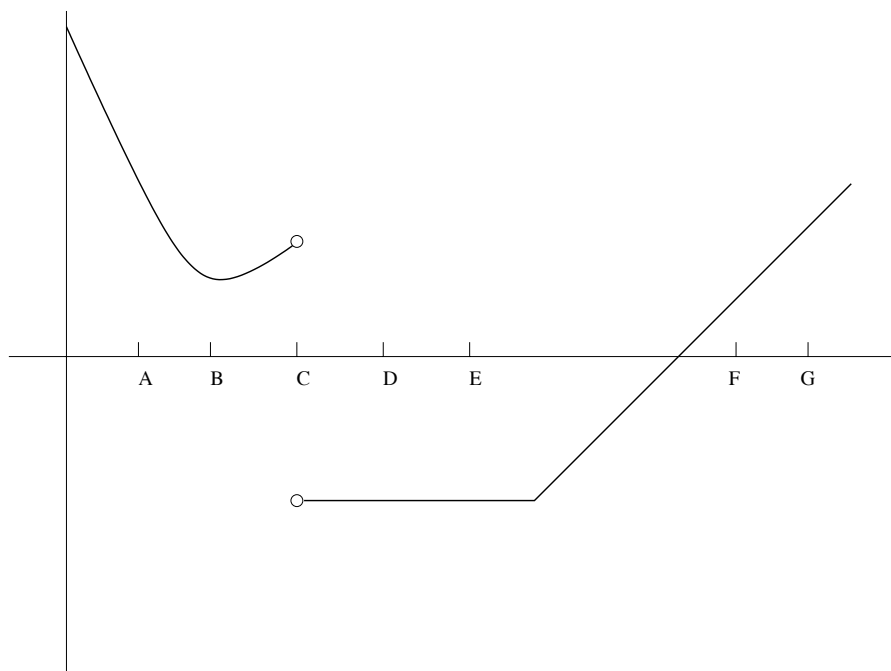
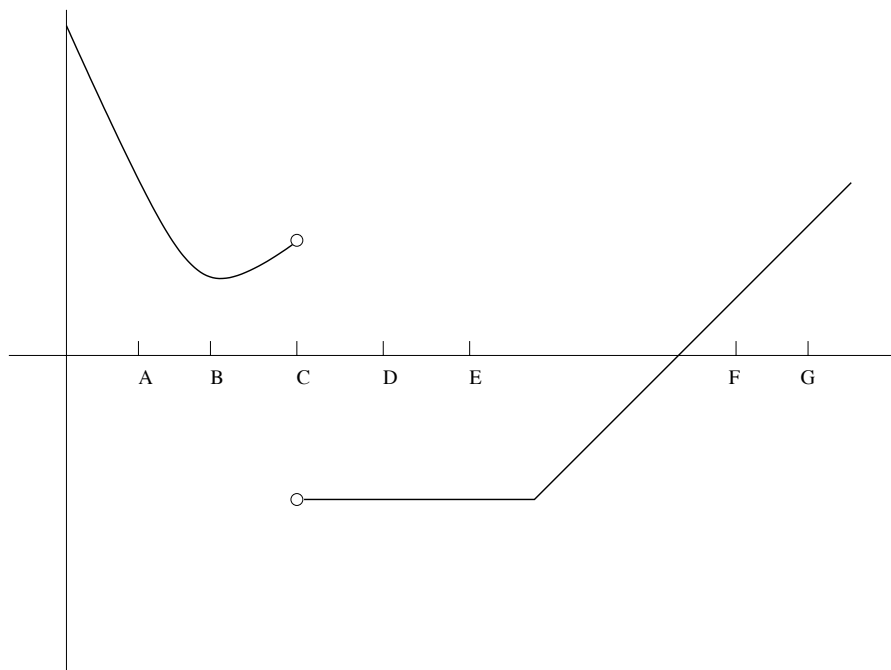
2. (8 points) Below is the graph of $f'(x)$, for some function $f(x)$. For each of the following multiple choice questions, circle the one correct answer. The choice of DNE means that the indicated quantity does not exist, and the choice of NEI means that there is not enough information for you to conclude that any of the other answers are valid.



- (a) At $x = A$, f is concave up concave down NEI.
- (b) $f'''(B) \geq 0$ $f'''(B) < 0$ DNE NEI.
- (c) Is f differentiable at $x = C$? Yes No NEI.
- (d) Is f continuous at $x = C$? Yes No NEI.
- (e) $f(D) > f(E)$ $f(D) = f(E)$ $f(D) < f(E)$ NEI.
- (f) Is f continuous at $x = F$? Yes No NEI.
- (g) $f'''(F) > 0$ $f'''(F) = 0$ $f'''(F) < 0$ NEI.
- (h) $f''(B) < f''(G)$ $f''(B) = f''(G)$ $f''(B) > f''(G)$ NEI.

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3. (3 points) Here is the same graph of the derivative $f'(x)$ as in the previous problem. Below it sketch a possible (continuous) graph of $y = f(x)$.



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4. (4 points) Find the equation for the tangent line to the curve $y = \frac{2}{x}$ at $x = 2$.

5. (3 points) Compute $f'(x)$ if $f(x) = \frac{\sin x^3}{x}$.

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6. (6 points) Find dy/dx if

(a) $y = e^{\sqrt{1+3x}} \cos x$

(b) $y = x^\pi + \pi^x.$

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7. (5 points) Suppose $f(x) = x^4 - 4x^3$. On which intervals is $f(x)$ both decreasing and concave up?

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8. (5 points) Below is a table of values for a function $f(x)$ and its derivative $f'(x)$.

x	-2	-1	0	1	2	3
$f(x)$	-3	1	0	2	2	-2
$f'(x)$	3	-1	0	1	-2	-7

Use the table to answer the following questions.

- (a) If $g(x) = 5f(x)$, what is $g'(1)$?
- (b) If $h(x) = f(x + 1) + 4$, what is $h'(0)$?
- (c) If $k(x) = f(-2x)$, what is $k'(1)$?
- (d) Give an estimate for $f''(1.5)$.