

Math 125

Second Midterm

March 20, 2007

Name: _____ ID: _____ Rec: _____

Question:	1	2	3	4	5	6	7	8	Total
Points:	12	12	8	8	16	14	10	10	90
Score:									

There are 8 problems in this exam, printed on 6 pages (not including this cover sheet). Make sure that you have them all.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate **clearly** what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** You are free to use a time machine to travel ahead in time and check your answers, provided you also let me use it to go back in time and change the questions.

Leave all answers in exact form (that is, do *not* approximate π , square roots, and so on.)

You have 90 minutes to complete this exam.

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1. For each of the functions $f(x)$ given below, find $f'(x)$.

(a) 4 points $f(x) = x^5 + 5x^4 + 4x^2 + 9$

(b) 4 points $f(x) = x^8 e^x$

(c) 4 points $f(x) = \frac{3x^2 + 9}{x^3 + 2 \tan x}$

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2. Compute each of the following derivatives as indicated:

(a) 4 points $\frac{d}{d\theta} \left[\cos \left(\frac{\pi}{180} \theta \right) \right]$

(b) 4 points $\frac{d}{du} [\sin(3u) \sin(5u)]$

(c) 4 points $\frac{d}{dt} \left[\frac{t}{5} - \frac{5}{t} \right]$

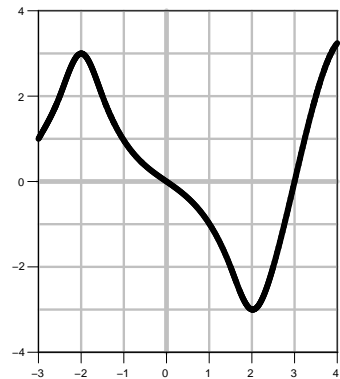
3. 8 points Write a limit that represents the slope of the graph

$$y = \begin{cases} 2 + x \ln |x| & x \neq 0 \\ 2 & x = 0 \end{cases}$$

at $x = 0$. You **do not need to evaluate the limit**.

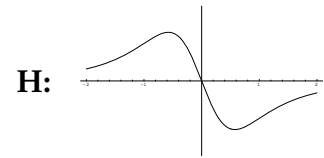
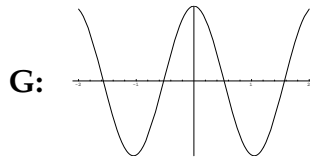
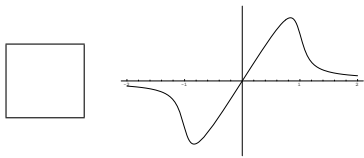
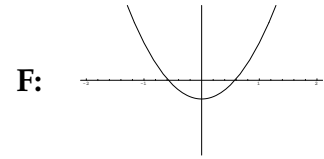
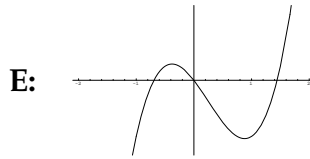
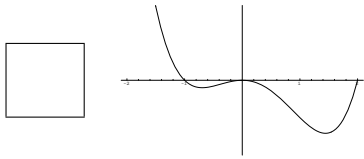
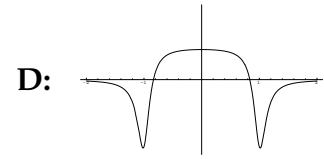
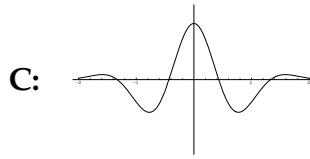
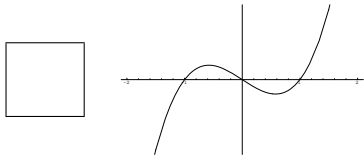
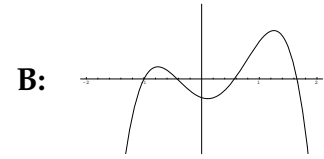
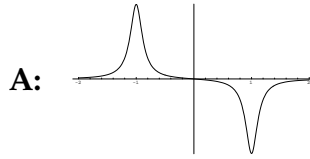
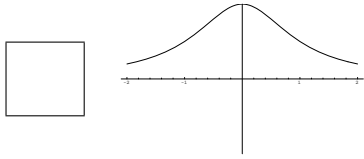
4. At right is the graph of **the derivative** f' of a function.

- (a) 4 points List all values of x with $-3 \leq x \leq 4$ where $f(x)$ has a local maximum.



- (b) 4 points At $x = -1$, is $f(x)$ concave up, concave down, or neither?

5. 16 points For each of the 4 functions graphed in the left column, find the corresponding derivative function among any of the 8 choices on the right (not just on the same row) and put its letter in the corresponding box.



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

(a) 3 points Calculate $f'(x)$

(b) 3 points Calculate $f''(x)$?

(c) 4 points For what values of x is $f(x)$ increasing?

(d) 4 points For what values of x is $f(x)$ concave down?

7. 10 points Write the equation of the line tangent to the curve

$$y = 3x^4 - x + \sqrt{x} \quad \text{at } x = 1$$

8. 10 points A ladder 12 feet long rests against a vertical wall. Let θ be the angle between the top of the ladder and the wall, and let ℓ be the distance from the bottom of the ladder to the wall. If the bottom of the ladder slides away from the wall, how fast does ℓ change with respect to θ when $\theta = \frac{\pi}{6}$?

