

# Practice Midterm 2

## MAT 125

Spring 2006

Name: \_\_\_\_\_ ID number: \_\_\_\_\_

Recitation number (e.g., R01): \_\_\_\_\_  
 (for evening lecture, use “ELC 4”)

<b>Lecture 1</b>	MWF 9:35–10:30	An, Daniel
R01	M 11:45am–12:40pm	Solorzano, Pedro
R02	Th 3:50pm– 4:45pm	Ostrovsky, Stanislav
R03	W 11:45am–12:40pm	Solorzano, Pedro
R04	Tu 11:20am–12:15pm	Basu, Somnath
R05	Tu 11:20am–12:15pm	Han, Zhigang
R31	M 10:40am–11:35am	Patu, Ionel
<b>Lecture 2</b>	TuTh 2:20pm – 3:40pm	Kirillov, Alexander
R06	M 11:45am–12:40pm	Zeng, Huayi
R07	F 11:45am–12:40pm	Nowicki, Jan
R08	W 9:35am–10:30am	Ma, Xin
R09	Tu 3:50pm– 4:45pm	Ostrovsky, Stanislav
R10	F 8:30am–9:25am	Ma, Xin
<b>Lecture 3</b>	MW 3:50pm–5:10pm	Chen, Je-Wei
R11	M 9:35am–10:30am	Poole, Thomas
R12	F 10:40am–11:35am	Panok, Lena
R13	W 2:20pm–3:15pm	Poole, Thomas
R14	Tu 11:20am–12:15pm	Lyberg, Ivar
R15	Th 11:20am–12:15pm	Lyberg, Ivar
R32	M 2:20pm– 3:15pm	Guo, Weixin
<b>Evening Lec 4</b>	TuTh 6:50pm–8:10pm	Bulawa, Andrew

Please answer each question in the space provided. Please write full **solutions**, not just answers. Unless otherwise marked, **answers without justification will get little or no partial credit**. Cross out anything the grader should ignore and circle or box the final answer. Do **NOT** round answers.

No books, notes, or calculators!

**Do not open the exam until instructed by proctor!**

1. Compute the following limits. Please distinguish between “limit is equal to  $\infty$ ”, “limit is equal to  $-\infty$ ” and “the limit doesn’t exist even allowing for infinite values”:

(a)  $\lim_{x \rightarrow \infty} \frac{x^3 + 2x + 1}{x^3 - 15x}$

(b)  $\lim_{x \rightarrow 2^-} \frac{x^2 - 2x - 3}{x^2 - 5x + 6}$

(c)  $\lim_{x \rightarrow 3^+} \frac{x^2 - 2x - 3}{x^2 - 5x + 6}$

(d)  $\lim_{x \rightarrow \infty} \frac{1}{e^{(x^2)} + 1}$

2. Calculate derivatives of the following functions:

(a)  $3(x + \sqrt{x})$

(b)  $xe^x - 17x$

(c)  $\frac{2x}{x+1}$

(d)  $\frac{1+\sqrt{x}}{1-\sqrt{x}}$

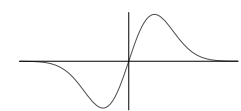
3. (15 points) Let  $f(x) = \left|1 + \frac{1}{x}\right|$ .

(a) Sketch the graph of  $f$  and identify the asymptotes.

(b) Find all values of  $x$  for which  $f$  is not continuous.

(c) Find all values of  $x$  for which  $f$  is not differentiable (you do not have to calculate the derivative).

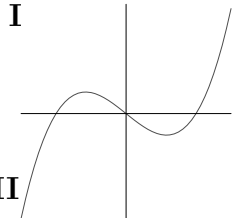
4. Match the graphs of functions **I–IV** below with the graphs of their derivatives **A–D**.  
 (Justification is not required.)



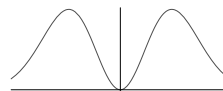
**I**



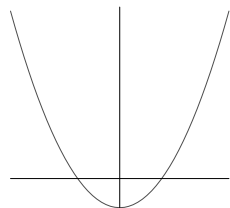
**II**



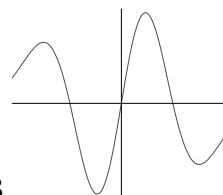
**III**



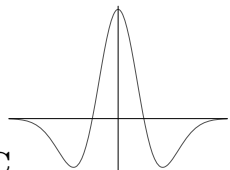
**IV**



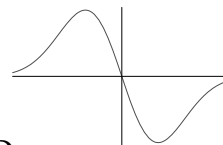
**A**



**B**



**C**



**D**

5. Let  $f(x) = x^3 - 3x^2 - 9x + 7$ .

- (a) Calculate  $f'$
- (b) Calculate  $f''$
- (c) On which intervals does  $f$  increase? decrease?
- (d) On which intervals is  $f$  concave up?

6. Find all tangent lines to the graph of  $f(x) = 1/x$  which have slope  $m = -1/4$ ; write equations of each of these tangent lines.

7. (a) Write the linear approximation for the function  $g(x) = \frac{1}{e^x+1}$  near  $x = 0$ .
- (b) Use the linear approximation you found in the previous part to estimate  $\frac{1}{e^{0.01}+1}$ .