Mathematics 211, Lecture 2   Name: _____

Instructor: L. Maxim   TA's Name: _____

PRACTICE EXAM I

Do all five of the following problems. Show all your work, and write neatly.
Answers without full justification will only receive partial credit.
Use of books, notes, phones or calculators during the exam is NOT allowed.

No.	Points		Score
1	20		
2	20		
3	20		
4	20		
5	20		
	100	**TOTAL POINTS**	

Problem I. (20 points)
A bacteria culture starts with 500 bacteria and doubles in size every half hour.
a)   How many bacteria are there after 3 hours?
b)   How many bacteria are there after t hours?
c)   How many bacteria are there after 40 minutes?
d)   Estimate the time for the population to reach $100,000$.

Problem II. (20 points)
Evaluate the following limits:

a)
$$\lim_{x \to 7} \frac{\sqrt{x+2} - 3}{x - 7}$$

b)
$$\lim_{x \to -4} \frac{\frac{1}{4} + \frac{1}{x}}{4 + x}$$

Problem III. (20 points)

Let

$$f(x) = \begin{cases} -x & \text{if } x \le -1, \\ 1 - x^2 & \text{if } -1 < x < 1, \\ x - 1 & \text{if } x > 1. \end{cases}$$

a) Evaluate each of the following limits, if it exists.

$$(i) \ \lim_{x \to 1^+} f(x) \qquad (ii) \ \lim_{x \to 1} f(x) \qquad (iii) \ \lim_{x \to 0} f(x).$$

b) Evaluate each of the following limits, if it exists.

$$(i) \ \lim_{x \to -1^-} f(x) \qquad (ii) \ \lim_{x \to -1^+} f(x) \qquad (iii) \ \lim_{x \to -1} f(x).$$

If the function f continuous at $x = -1$? Justify your answer.

Problem IV. (20 points)

a)   Find an equation of the tangent line to the graph of $y = f(x)$ at $x = 2$ if $f(2) = -1$ and $f'(2) = 3$.

b)   Find an equation of the tangent line to the parabola $y = 3x^2 - 5x$ at the point $(2, 2)$.

Problem V. (20 points)

Find the derivative of the function

$$f(x) = \frac{1}{x}$$

using the definition of the derivative. State the domain of the function f and the domain of its derivative f'.