

Mathematics 221, Lecture 2
Instructor: L. Maxim

Name: _____
TA's Name: _____

PRACTICE EXAM I

Do all six of the following problems. Show all your work, and write neatly.

No.	Points		Score
1	15		
2	20		
3	15		
4	20		
5	15		
6	15		
	100	TOTAL POINTS	

Problem I (15 points) Find the tangent line to the curve $x^2 + y^3 = 5y$ at the point $(2, 1)$.

Problem II (20 points) Starting at time $t = 0$, a particle moves along the x -axis in such a way that at time t its position is given by $x = 27t - t^3$, where t is measured in seconds.

a) Find the average velocity of the particle during the time interval $0 \leq t \leq 2$.

b) The particle moves to the right for a while, reaches some furthest right point, and then starts turning to the left. What is the velocity and acceleration of the particle at the moments when it is at its furthest right point? When and where does that occur?

c) When does the particle reach the furthest right point?

Problem III (15 points) Evaluate the following limits.

a) $\lim_{x \rightarrow 2} \frac{4-x^2}{x-2}$

b) $\lim_{x \rightarrow 0} \frac{\sin^2(x)}{x}$

c) $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x}$. (Hint: use the sandwich theorem.)

Problem IV (20 points) Find vertical and horizontal asymptotes for the graph of the function

$$f(x) = \frac{x^2 - 2x + 1}{2x^2 + x},$$

then sketch its graph.

Problem V (15 points) Let

$$f(x) = \begin{cases} x + 1, & x \leq 0 \\ 1 - x, & x > 0. \end{cases}$$

a) Show f is continuous at every point in its domain.

b) Show $f'(0)$ does not exist.

Problem VI (15 points) Find an equation of the straight line having slope $1/4$ that is tangent to the curve $y = \sqrt{x}$.