

UC Merced: MATH 21 — Exam #1 — 22 February 2008

On the front of your bluebook print (1) your name, (2) your student ID number, (3) your discussion section number and instructor's name (Lei or Yatskar) and (4) a grading table. Show all work in your bluebook and BOX IN YOUR FINAL ANSWERS where appropriate. A correct answer with no supporting work may receive no credit while an incorrect answer with some correct work may receive partial credit. Textbooks, class notes, calculators and crib sheets are not permitted. There are a total of five problems on one side of this paper and a total of 50 points. Please start each of the five problems on a new page. You have 50 minutes to complete the exam.

1. (10 points total, 2 each) Each of the following statements is *false*. Explain why each statement is false or provide a counter-example to show that it is false. Your answer to each part should not exceed two lines of text.

(a) $\frac{x^2 - 9}{x + 3} = x - 3$ for all x .

(b) If $\lim_{x \rightarrow 2} f(x) = 5$, then $f(2) = 5$.

(c) $\frac{d}{dx}|x| = |1| = 1$.

(d) If $f(x)$ is continuous at all x , then it is differentiable at all x .

(e) $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ does not exist because $x = 0$ cannot be a denominator.

2. (15 points total, 5 each) Find the requested limits, if they exist. If they do not exist, explain why not.

(a) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$

(b) $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x}$ (Hint: The Squeeze Theorem.)

(c) $\lim_{x \rightarrow 2} \frac{|x - 2|}{x - 2}$

3. (25 points total) Answer the following derivative-related problems.

(a) (10 points) Using the definition of a derivative, calculate $g'(x)$ where $g(x) = \frac{1}{1 - x}$.

(b) (5 points) Find the derivative of $y = (7x^2 - x + 1) \sin(x)$.

(c) (5 points) Differentiate $g(x) = \cos \sqrt{x}$.

(d) (5 points) Find an equation of the tangent line to $y = \frac{5x^3 + 1}{x}$ at $x = -1$.