UC Merced: MATH 21 — Exam #1 — 28 September 2007

On the front of your bluebook print (1) your name, (2) your student ID number, (3) your discussion section number and instructor's name (Sprague or Lei) 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) Answer the following **Always** True (T) or False (F). Only your final answers will be graded on these problems.

   (a) (3 points) If $\lim_{x\to 5} f(x) = \infty$ and $\lim_{x\to 5} g(x) = -\infty$, then $\lim_{x\to 5}[f(x) + g(x)] = 0$

   (b) (3 points) An equation of the tangent line to the parabola $y = x^2$ at $(-2, 4)$ is $y - 4 = 2x(x + 2)$.

   (c) (2 points) $\lim_{x\to 0} \dfrac{x}{\sin(x)} = 1$

   (d) (2 points) The domain of $b(x) = \sqrt{[\sin(x)]^2 + x^2}$ is all real numbers.

2. (5 points) Given that $-\dfrac{x^2}{2} + 2x + 2 \le g(x) \le x + \dfrac{5}{2}$ for all x, use the Squeeze (Sandwich) Theorem to find $\lim_{x\to 1} g(x)$. Explain your reasoning.

3. (10 points total) Find the requested limits, if they exist. If they do not exist, explain.

   (a) (5 points) $\lim_{x\to 2} \dfrac{x^2 - 4}{x - 2}$

   (b) (5 points) $\lim_{x\to 2^-} \dfrac{|x - 2|}{x - 2}$

4. (20 points total) Answer the following derivative-related problems

   (a) (10 points) Using the definition of a derivative, calculate $g'(x)$ where $g(x) = \dfrac{1}{x + 5}$.

   (b) (10 points) Determine $\dfrac{dw}{dt}$, where $w(t) = (t^2 + 1 + t^{-2}) \tan(t^2)$.

5. (5 points) Sketch carefully $q'(x)$ on $-3/4 \le x \le 3/4$ given the following graph of $q(x)$. Be sure to label your axes.