Name: _______________________

Calculus 252 Problems, Fall 2005, Set 2

Edited from Rutgers University

Please write solutions to ONE of these problems (as announced in the Lab) and hand it in at the Lab next week. Your written solution should follow the guidelines in the sheet ‘Writing up lab problems’ that you received at the lab. DO NOT TRY TO WORK OUT THE SOLUTIONS ON THIS PIECE OF PAPER.

1. Using your calculator, graph the function \( f(x) = \frac{1}{1+x^2} \) for \( 0 \leq x \leq 2 \).
   a. What is the largest value of \( f(x) \) on this interval \( 0 \leq x \leq 2 \)? The smallest value?
   b. Use your answer to a. and the geometric meaning of the definite integral as an area to show that
   \[
   0.4 \leq \int_0^2 f(x) \leq 2.
   \]
   c. By cutting the interval \( 0 \leq x \leq 2 \) into two pieces and repeating a. and b. for each piece, show that
   \[
   0.7 \leq \int_0^2 f(x) \leq 1.5.
   \]
   d. Now cut the interval into four pieces and repeat a. and b. for each piece to find closer lower and upper estimates for the integral. Show the graphical representation.
   e. Use the \( fnInt( \) program in your calculator to calculate the numerical value of the integral. (The exact answer is \( \arctan(2) \).)

2a. A car is traveling at 50mph when the brakes are fully applied, producing a constant deceleration of 40 ft/s\(^2\). What is the distance covered before the car comes to a complete stop?
   b. A car braked with a constant deceleration of 40 ft/s\(^2\) and produced skid marks 160 ft. before coming to a stop. How fast was the car going when the brakes were first applied?

3a. Sketch the region \( 0 \leq y \leq 1/x^2, 1 \leq x \leq 4 \).
   b. Find a number \( a \) such that the line \( x = a \) divides the region in a. into two parts of equal area.
   c. Find a number \( b \) such that the line \( y = b \) divides the region in a. into two parts of equal area.