M 408C
September 1, 2010

1. Just for practice, solve the following inequalities:

$$|x-4|<3, \qquad |2x+6|\le 7, \qquad 3|5-x|\ge 4,$$
$$|x-2|+|x|<9, \qquad |x+9|>-1, \qquad |5x-2|\le 0$$

2. Determine whether the function

$$f(x)=\begin{cases} 1, & \text{if } x=0 \\ x^2\sin(1/x), & \text{if } x\neq 0 \end{cases}$$

is continuous. If it isn't continuous, can you change it slightly so that it is?

3. Same question, different function:

$$f(x)=\begin{cases} \frac{|x^2-3x-28|}{x-7}, & \text{if } x\neq 7 \\ 11, & \text{if } x=7. \end{cases}$$

4. Prove that $f(x)=3x$ is continuous.

5. Is it true that every continuous function looks like a line if you zoom in enough? i.e. is every continuous function locally linear? What about the converse? i.e. is every function that is locally linear also continuous?

6. I walked to class along a straight line from my car. The graph below shows my position (relative to my car) as a function of time. When was I moving away from my car? Toward my car? Standing still? Plot my velocity as a function of time.

7. Is it true that every continuous function looks like a line if you zoom in enough? i.e. is every continuous function locally linear? What about the converse? i.e. is every function that is locally linear also continuous?