This homework is due at the start of lab on Tuesday, February 11. Sample answers will be posted on line at that time. Remember that there is a test on Wednesday, February 12. The material on this homework will be on the test, except that the test will not include any proofs using the epsilon-delta definition of limit.

1. Suppose that $\lim_{x\to a} f(x) = M$, and c is a constant that is not equal to zero. Use the epsilon-delta definition of limit to prove that $\lim_{x\to a}(cf(x)) = cM$.

2. You start your car at 12:00 noon and arrive at your destination 60 miles away at 1:00 PM. So you have covered 60 miles in one hour.

a) What was your average velocity?

b) Explain intuitively why it is not possible that your (instantaneous) velocity was less than 60 miles per hour at every point in your journey.

c) Explain intuitively why your instantaneous velocity was a continuous function of time.

d) Use the Intermediate Value Theorem to deduce that there must be some time during your journey when your velocity was exactly 60 miles per hour.

3. Use the definition of $f'(a)$ as $\lim_{x\to a} \dfrac{f(x) - f(a)}{x - a}$ to compute the following derivatives.

a) $f'(3)$, where $f(x) = 2x - 1$

b) $f'(-2)$, where $f(x) = 3x^2$

c) $f'(1)$, where $f(x) = \frac{1}{x+1}$

4. Use the definition of $f'(a)$ as $\lim_{h\to 0} \dfrac{f(a+h) - f(a)}{h}$ to compute the following derivatives.

a) $f'(2)$, where $f(x) = 2x - 3x^2$

b) $f'(1)$, where $f(x) = x^3$

c) $f'(0)$, where $f(x) = \sqrt{x+9}$