MATH 310: Homework 11 **Due Wednesday 8/15/2012**

1. Suppose $\{a_n\}$ converges to 1. Show that there is some $N \in \mathbb{N}$ such that $(n > N) \to (a_n > 0)$. [5 pts]
2. Show that $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 5 - 3x$ is continuous at $x = 7$. [10 pts]
3. Show that $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 2x^2 - 2x - 1$ is continuous at $x = 3$. [20 pts]
4. Suppose $f : \mathbb{R} \to \mathbb{R}$ is defined by [15 pts]

$$f(x) = \begin{cases} 2 & \text{if } x \leq 3 \\ 1 - x & \text{if } x > 3 \end{cases}$$

   Show that f is not continuous at $x = 3$.
5. Suppose $f : \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = x^2 + 3x + 1$. Show that $f'(2) = 7$. [10 pts]
6. Suppose $f : \mathbb{R} \to \mathbb{R}$ is defined by [10 pts]

$$f(x) = \begin{cases} \frac{1}{2}x & \text{if } x \leq 2 \\ x^2 - 3 & \text{if } x > 2 \end{cases}$$

   Show that $f'(2)$ is undefined.