Math 111 - Homework 2

Instructions: Although it is not stated after each question, you must explain your answers and show all of your work. You are allowed to work with others, but should only consult your textbook and your notes as resources, and of course you may consult me as well. Also, please try your best to write neatly.

This assignment is due on September 18, 2013 by 5:00pm. You may turn it into me during class, or drop it off in my mailbox which is located in the mail room next to the front desk area on the 4th floor. I will also accept it via e-mail if you so desire.

1. Find \( \lim_{x \to 3^+} \frac{x^2 + x - 12}{x^2 - 9} \).

2. Find \( \lim_{x \to 1^-} \frac{x - 1}{\sqrt{x} - 1} \).

3. Let

\[
f(x) = \begin{cases} 
  \frac{x^2 + 1}{x + 1}, & \text{if } x > -1 \\
  \frac{x^2 - 1}{x + 1}, & \text{if } x \leq -1
\end{cases}
\]

Find \( \lim_{x \to -1^+} f(x) \) and \( \lim_{x \to -1^-} f(x) \).

4. Let

\[
f(x) = \begin{cases} 
  cx^2, & \text{if } x \geq 2 \\
  x + 6, & \text{if } x < 2
\end{cases}
\]

For what value of \( c \) does \( \lim_{x \to 2} f(x) \) exist?

5. Define a function \( f(x) \) such that \( \lim_{x \to 0^-} f(x) = 2 \), \( \lim_{x \to 0^+} f(x) = 2 \), and \( f(0) = 0 \).

6. Show that \( \lim_{x \to 0} x \sin(1/x) = 0 \). (Hint: Think about \( \pm |x| \))