MATH 160 Homework 19 Name: _____
Due 10/28 MATH 160 section _____

1. Evaluate the following limits.

   a. $\lim_{x\to 0} \dfrac{1-\cos(x)}{x^2}$.

   b. $\lim_{x\nearrow 7} \dfrac{4}{x-7}$.

   c. $\lim_{x\to\infty} \dfrac{2x^2+3x}{x^3+x+1}$.

   d. $\lim_{x\searrow 0} \dfrac{2x}{x+7\sqrt{x}}$.

   e. $\lim_{x\searrow 0} \dfrac{\cot(x)}{\csc(x)}$.

2. Find a value of c that makes the function

$$f(x) = \begin{cases} \frac{9x-3\sin(3x)}{5x^3}, & x \neq 0 \\ c, & x = 0. \end{cases}$$

   continuous at $x = 0$. Explain why your value of c works.

3. Suppose that

$$f(x) = \begin{cases} x+2, & x \neq 0 \\ 0, & x = 0. \end{cases}$$

   and

$$g(x) = \begin{cases} x+1, & x \neq 0 \\ 0, & x = 0. \end{cases}$$

   a. Show that

$$\lim_{x\to 0} \frac{f'(x)}{g'(x)} = 1 \quad \text{and} \quad \lim_{x\to 0} \frac{f(x)}{g(x)} = 2.$$

   b. Does this contradict l'Hôpital's Rule? Explain why or why not.