Math 251 Fall 2017   **Quiz #9, November 8th**

Name: _____

There are 25 points possible on this quiz. This is a closed book quiz. Calculators and notes are not allowed. **Please show all of your work!** If you have any questions, please raise your hand.

Exercise 1. (12 pts.) Evaluate the limits below. Use L'Hospital's Rule where appropriate. **Indicate when you are using L'Hospital's Rule and state explicitly the indeterminate form.**

(a.) $\displaystyle\lim_{\theta\to\pi/2} \frac{\cos\theta}{\sin(6\theta)}$

(b.) $\displaystyle\lim_{x\to\infty} x^4 e^{-x^3}$

(c.) $\displaystyle\lim_{x\to0}(1-5x)^{1/x}$

Exercise 2. (10 pts.) Use the information below to answer questions about the function $f(x)$. Make sure you answer the question! If something doesn't exist, you must explicitly state this.

$$f(x) = \frac{1}{x^2+6}, \quad f'(x) = \frac{-2x}{(x^2+6)^2}, \quad f''(x) = \frac{6(x^2-2)}{(x^2+6)^3}.$$

(a.) Find the interval(s) where the function is increasing and the interval(s) where the function is decreasing.

(b.) Find the local maximum and minimum values of f and where they occur.

(c.) Find the intervals of concavity and any inflection points.

Exercise 3. (3 pts.) Given $f(x) = 2 + xe^{-x}$, $f'(x) = -(x-1)e^{-x}$, and $f''(x) = (x-2)e^{-x}$, use the Second Derivative Test to identify the local minimum and maximum values of f or explain why the test is inconclusive.