M408N Worksheet, Due Monday, September 17

1) Explain in your own words what is meant by the equation $\lim_{x\to 2} f(x) = 4$. Is it possible for this statement to be true and still have $f(2) = 5$? Either explain why this can't happen, or sketch the graph of a function where it does happen.

2) Explain what it means to say that $\lim_{x\to 1^-} f(x) = 3$, and what it means to say that $\lim_{x\to 1^+} f(x) = 6$. Sketch the graph of a function where both of these are ture. If both of these are true, is it possible for $\lim_{x\to 1} f(x)$ to exist? Why or why not?

3) Explain what each of these mean, and sketch a graph to go with your explanation. (a) $\lim_{x\to 2} f(x) = \infty$. (b) $\lim_{x\to 3^+} g(x) = -\infty$.

4) With a calculator, investigate numerically the limit $\lim_{x\to 0} \frac{\sin(x)}{x}$. That is, plug in a bunch of values of x close to zero and see what they tend to. Remember that angles are always measured in radians when we do calculus. (You should turn in a table of values that you plugged in to justify what you claim is the limit.)

5) Now do the same for $\lim_{x\to 0} \frac{1-\cos(x)}{x^2}$.

6) Use the limit laws to evaluate the following limits (if they exist):

(a) $\lim\limits_{x\to 2} \dfrac{\sqrt{4x+1}-3}{x-2}$

(b) $\lim\limits_{a\to 0} \dfrac{(3+a)^{-1}-3^{-1}}{a}$

(c) $\lim\limits_{h\to 0} \dfrac{(3+h)^2-3^2}{h}$

7) Compute $\lim_{x\to 0} |x| \sin(1/x)$, if it exists.