Honors Calculus 131. Problem set 2.
Due September 5.

1) Evaluate the limit

$$\lim_{h\to 0}\frac{(3+h)^{-1}-\frac{1}{3}}{h}.$$

2) Give a geometric interpretation and evaluate the limit

$$\lim_{x\to 0}\frac{\sqrt{3+x}-\sqrt{3}}{x}.$$

3) Is there a number a such that the limit

$$\lim_{x\to -2}\frac{3x^2+ax+a+3}{x^2+x-2}$$

exists? If so, find the value of a and the value of the limit.

4) Evaluate the following limits in terms of the number

$$A=\lim_{x\to 0}\frac{\sin x}{x}.$$

Later we will show that $A=1$:

a) $\lim_{x\to 0}\frac{\sin 2x}{x}$.
b) $\lim_{x\to 0}\frac{\sin^2 2x}{x^2}$.
c) $\lim_{x\to 0}\frac{1-\cos x}{x}$.
d) $\lim_{h\to 0}\frac{\sin(x+h)-\sin x}{h}$.
e) $\lim_{x\to 1}(x^2-1)^3\sin^3\left(\frac{1}{x-1}\right)$.