Math 1A
Quiz 3 - September 16, 2009

Name: Key

1. Evaluate the following limits. If no limit exists, briefly say why.

(a) $\lim_{x\to 2} \dfrac{x^2+x-6}{x^2-4}$ $= \lim_{x\to 2} \dfrac{(x+3)(x-2)}{(x+2)(x-2)} = \lim_{x\to 2} \dfrac{x+3}{x+2} = \boxed{\dfrac{5}{4}}$

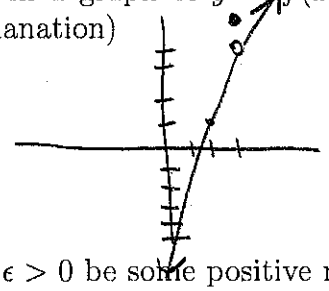
(b) $\lim_{x\to 0} \dfrac{\sqrt{3+x}-\sqrt{3}}{x} \cdot \dfrac{(\sqrt{3+x}+\sqrt{3})}{(\sqrt{3+x}+\sqrt{3})} = \lim_{x\to 0} \dfrac{(3+x)-(3)}{x(\sqrt{3+x}+\sqrt{3})} = \dfrac{x}{x(\sqrt{3+x}+\sqrt{3})}$

$= \lim_{x\to 0} \dfrac{1}{\sqrt{3+x}+\sqrt{3}} = \dfrac{1}{\sqrt{3}+\sqrt{3}} = \boxed{\dfrac{1}{2\sqrt{3}}}$

2. Let

$$f(x) = \begin{cases} 3x-5 & \text{if } x \neq 3 \\ 5 & \text{if } x = 3 \end{cases}$$

(a) Sketch a graph of $y = f(x)$. Where is $f(x)$ *not* continuous? (Give a BRIEF explanation)



f is not continuous when $x=3$ because $\lim_{x\to 3} f(x) \neq f(3)$

(b) Let $\epsilon > 0$ be some positive number. Find a $\delta > 0$ so that if $0 < |x-3| < \delta$ then $|f(x)-4| < \epsilon$.

$|f(x)-4| < \varepsilon$

$|(3x-5)-4| < \varepsilon$

$|3x-9| < \varepsilon$

$3|x-3| < \varepsilon$

$|x-3| < \varepsilon/3$

Choose $\delta = \varepsilon/3$.

(c) Can you find a different value of δ which works?

Any smaller positive value of δ will work, e.g. $\varepsilon/10$.