Find the limit shown below.

$$\lim_{x \to 1} \frac{x-1}{\sqrt{x+3}-2}$$

1) If you replace x with one, you get $\frac{1-1}{\sqrt{1+3}-2} = \frac{0}{\sqrt{4}-2} = \frac{0}{2-2} = \frac{0}{0}$

2) To remedy this, multiply top and bottom by the conjugage of $\sqrt{x+3}-2$. This conjugate is $\sqrt{x+3}+2$

3) $$\lim_{x \to 1} \frac{(x-1)}{\sqrt{x+3}-2} = \lim_{x \to 1} \left[\frac{(x-1)}{\sqrt{x+3}-2} \cdot \frac{\sqrt{x+3}+2}{\sqrt{x+3}+2} \right]$$ setup the multiplication

$$\lim_{x \to 1} \frac{(x-1)}{\sqrt{x+3}-2} = \lim_{x \to 1} \frac{(x-1)\left(\sqrt{x+3}+2\right)}{\left(\sqrt{x+3}\right)^2 + 2\sqrt{x+3} - 2\sqrt{x+3} - 4}$$ multiply in the bottom

$$\lim_{x \to 1} \frac{(x-1)}{\sqrt{x+3}-2} = \lim_{x \to 1} \frac{(x-1)\left(\sqrt{x+3}+2\right)}{x+3-4}$$ middle terms in bottom cancel

$$\lim_{x \to 1} \frac{(x-1)}{\sqrt{x+3}-2} = \lim_{x \to 1} \frac{(x-1)\left(\sqrt{x+3}+2\right)}{(x-1)}$$ cancel x-1 in the top with the one in the bottom

$$\lim_{x \to 1} \frac{(x-1)}{\sqrt{x+3}-2} = \lim_{x \to 1} \left(\sqrt{x+3}+2\right) = \sqrt{1+3}+2 = \sqrt{4}+2=2+2=4$$ replace x with 1 to get 4