Name: Solutions Quiz 1

As always, show all your work clearly. An unjustified answer receives no credit.

1. Find the average rate of change of the function $f(x) = (x+1)^2$ over the interval $x = 2$ to $x = 4$. (Simplify your answer.) (4 pts)

2. Evaluate $\lim_{x \to 1} \dfrac{\sqrt{x^2+2} - \sqrt{3}}{x - 1}$. (6 pts)

$\boxed{\#1}$ Avg r.o.c. is slope between two pts:

$$\frac{f(4)-f(2)}{4-2} = \frac{(4+1)^2 - (2+1)^2}{2} = \frac{25-9}{2} = \frac{16}{2} = \boxed{8}$$

$\boxed{\#2}$ Plugging in $x=1$ gives $\frac{0}{0}$, indeterminate.

$$\lim_{x \to 1} \frac{\sqrt{x^2+2} - \sqrt{3}}{x-1} \cdot \frac{(\sqrt{x^2+2} + \sqrt{3})}{(\sqrt{x^2+2} + \sqrt{3})} = \lim_{x \to 1} \frac{(x^2+2-3)}{(x-1)(\sqrt{x^2+2}+\sqrt{3})}$$

$$= \lim_{x \to 1} \frac{x^2-1}{(x-1)(\sqrt{x^2+2}+\sqrt{3})} = \lim_{x \to 1} \frac{\cancel{(x-1)}(x+1)}{\cancel{(x-1)}(\sqrt{x^2+2}+\sqrt{3})}$$

$$= \frac{2}{\sqrt{1+2}+\sqrt{3}} = \frac{2}{2\sqrt{3}} = \boxed{\frac{1}{\sqrt{3}}}$$

Note: in general, $\frac{a}{b} \neq \frac{a^2}{b^2}$ (e.g. $\frac{1}{2} \neq \frac{1^2}{2^2} = \frac{1}{4}$)

so it is not valid to do $\dfrac{(\sqrt{x^2+2} - \sqrt{3})^2}{(x-1)^2}$

Also, $(a-b)^2 \neq a^2 - b^2$,

so $(\sqrt{x^2+2} - \sqrt{3})^2 \neq x^2+2-3$