Quiz 3 : (3-23-2022) Aamir Khan

① Negate the following:

a) $\forall x \in R,\ x>3 \rightarrow x^2>9$

b) $\forall a,b,c \in Z\ ((a-b)\%2=0)\wedge((b-c)\%2=0)\rightarrow((a-c)\%2=0)$

a) $\exists x \in R \mid x>3 \wedge x^2 \leq 9$

b) $\exists a,b,c \in Z \mid ((a-b)\%2=0)\wedge((b-c)\%2=0)\wedge((a-c)\% \neq 0)$

$\forall x,\ P(x) \rightarrow Q(x)$

$\sim(\forall x,\ P(x)\rightarrow Q(x)) \equiv \exists x \mid P(x) \wedge \sim Q(x)$

② Negate the definition of a limit sequence.

$\forall \varepsilon \in R>0,\ \exists N \in Z^+ \mid \forall n \in Z^+,\ n>N \rightarrow L-\varepsilon < a_n < L+\varepsilon$

$\sim(\forall x, \exists y \mid P(x) \rightarrow Q(x)) \equiv \exists x \mid \forall y,\ P(x) \wedge \sim Q(x)$

Negation:

$\exists \varepsilon \in R>0 \mid \forall N \in Z^+,\ \exists n \in Z^+ \mid n>N \wedge L-\varepsilon \geq a_n \geq L+\varepsilon$

③ Define the Abduction inference utilizing mathematical symbols: what type of error can be associated w/ this form of reasoning? where might it be used.

$$\forall x, \ P(x) \rightarrow Q(x)$$
$$Q(a) \text{ for a particular } a.$$
$$\therefore P(a)$$

- This form of reasoning demonstrates CONVERSE error.

- Doctors usually use this form of reasoning when deciding what to prescribe their patients.

- Basically, given $Q(a)$, there's a possibility that $P(a)$ can be true but it is NOT a certainty.