

1)

$$\begin{array}{l}
 p \rightarrow q \\
 p \rightarrow r \\
 r \\
 q \\
 \therefore p
 \end{array}$$

Abduction is used when the a proof can't be induced or deduced logically. due to the loss of control over an experiment.

Ex. : Evolution & Climate change.

2)

$$\begin{aligned}
 a. & \neg (\forall x \in \mathbb{R}, x > 3 \rightarrow x^2 > 9) \\
 & \equiv (\exists x \in \mathbb{R} \mid x > 3 \wedge x^2 \leq 9)
 \end{aligned}$$

$$b. \neg (\forall a, b, c \in \mathbb{Z}, ((a-b)\%2=0) \wedge ((b-c)\%2=0) \rightarrow (a-c)\%2=0)$$

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

$$3) \text{ Negate } \forall \epsilon > 0, \exists N \in \mathbb{Z}^+ \mid \forall n \in \mathbb{Z}^+, (n > N) \rightarrow (L - \epsilon < a_n < L + \epsilon)$$

$$\exists \epsilon > 0 \mid \forall N \in \mathbb{Z}^+, \exists n \in \mathbb{Z}^+ \mid (n > N) \wedge (L - \epsilon \geq a_n \geq L + \epsilon)$$

$$\text{or } \exists \epsilon > 0 (\forall N \in \mathbb{Z}^+ (\exists n \in \mathbb{Z}^+ ((n > N) \wedge (L - \epsilon \geq a_n \geq L + \epsilon))))$$