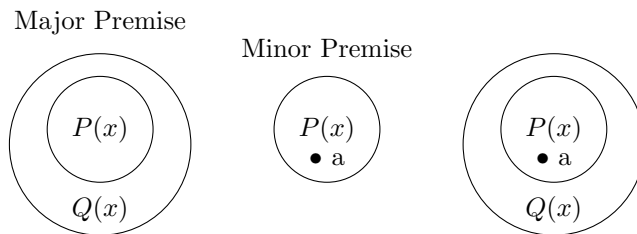


Notes

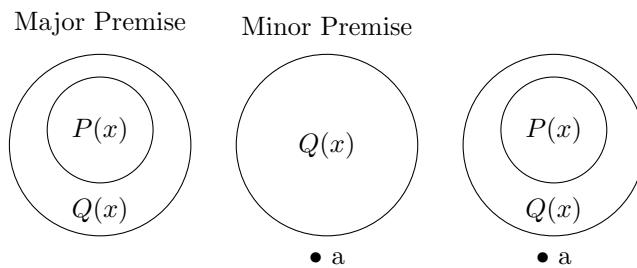
- Universal Modus Ponens

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



- Universal Modus Tollens

$$\begin{aligned} &\forall x, P(x) \rightarrow Q(x). \\ &\sim Q(a), \text{ for a particular } a \\ \therefore &\sim P(a) \end{aligned}$$



Test Yourself

1. all elements; any element in the domain.
2. $P(a)$; $\therefore Q(a)$
3. $\sim Q(a)$; $\therefore \sim P(a)$
4. Any x that makes $P(x)$ true makes $R(x)$ true.
5. valid; invalid