

Question 7

(i) The product of two odd integers is odd.

$$\forall x \in \mathbb{R}, \forall y \in \mathbb{R}, \forall p \in \mathbb{R}, xy = 2p+1 \Rightarrow (x = 2p+1 \wedge y = 2p+1)$$

Let $x = 3, y = 5$.

Then, $xy = 2p+1$ is true because $(x = 2p+1 \wedge y = 2p+1)$ is true

Therefore, the statement is true.

(ii) The negation of the statement "There is integer that is not a rational number."

$$\text{"There is integer that is not a rational number."} = \exists x, \sim \mathbb{Q}$$

$$\begin{aligned} \text{Negation of the statement} &= \sim(\exists x, \sim \mathbb{Q}) \\ &= \forall x, \mathbb{Q} \end{aligned}$$

(iii) Some students do not need to take any mathematics subjects.

$$\exists \text{ student } S, \forall \text{ mathematics subjects } M, S \text{ do not need to take } M$$

Whether this statement is true or false, it depends on the context.