

3 In each of the following cases choose one of the statements

$$P \Rightarrow Q \quad P \Leftarrow Q \quad P \Leftrightarrow Q$$

to describe the relationship between  $P$  and  $Q$ .

(i)  $P: y = 3x^5 - 4x^2 + 12x$

$$Q: \frac{dy}{dx} = 15x^4 - 8x + 12 \quad [1]$$

(ii)  $P: x^5 - 32 = 0$  where  $x$  is real

$$Q: x = 2 \quad [1]$$

(iii)  $P: \ln y < 0$

$$Q: y < 1 \quad [1]$$