1 Explain why each of the following statements is false. State in each case which of the symbols $\Rightarrow$, $\Leftarrow$ or $\Leftrightarrow$ would make the statement true.

(i) ABCD is a square $\Leftrightarrow$ the diagonals of quadrilateral ABCD intersect at 90° **[2]**

(ii) x^2 is an integer $\Rightarrow$ x is an integer **[2]**

2 Complete each of the following by putting the best connecting symbol ($\Leftrightarrow$, $\Leftarrow$ or $\Rightarrow$) in the box. Explain your choice, giving full reasons.

(i) $n^3 + 1$ is an odd integer ☐ n is an even integer **[2]**

(ii) $(x - 3)(x - 2) > 0$ ☐ $x > 3$ **[2]**

3 Select the best statement from

P $\Rightarrow$ Q
P $\Leftarrow$ Q
P $\Leftrightarrow$ Q
none of the above

to describe the relationship between P and Q in each of the following cases.

(i) P : WXYZ is a quadrilateral with 4 equal sides
Q : WXYZ is a square

(ii) P : n is an odd integer
Q : $(n + 1)^2$ is an odd integer

(iii) P : n is greater than 1 and n is a prime number
Q : $\sqrt{n}$ is not an integer **[3]**

4 Show that the following statement is false.

$$x - 5 = 0 \iff x^2 = 25$$

[2]

5 Given that n is a positive integer, write down whether the following statements are always true (T), always false (F) or could be either true or false (E).

(i) $2n + 1$ is an odd integer

(ii) $3n + 1$ is an even integer

(iii) n is odd $\Rightarrow n^2$ is odd

(iv) n^2 is odd $\Rightarrow n^3$ is even [3]

6 The converse of the statement '$P \Rightarrow Q$' is '$Q \Rightarrow P$'.

Write down the converse of the following statement.

'n is an odd integer $\Rightarrow 2n$ is an even integer.'

Show that this converse is false. [2]

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

$$P \Rightarrow Q \qquad P \Leftrightarrow Q \qquad P \Leftarrow Q$$

to describe the complete relationship between P and Q.

(i) P: $x^2 + x - 2 = 0$
Q: $x = 1$ [1]

(ii) P: $y^3 > 1$
Q: $y > 1$ [1]