Ans 4.

$$\text{lift}(X \to Y) = \frac{C(X \to Y)}{S(Y)}$$

$$C(X \to Y) = \frac{S(X \cup Y)}{S(X)}$$

$$S(Y) = P(Y)$$

$$\therefore \text{lift}(X \to Y) \Rightarrow \frac{P(Y|X)}{P(Y)}$$

NOW, $P(Y|X) = P(Y)$ if X & Y independent

If $\text{lift}(X \to Y) = 1$ then,

$$\frac{P(Y|X)}{P(Y)} = 1 \Rightarrow P(Y|X) = P(Y)$$

So, this is the condition for independence b/w X & Y.

Hence, the occurence of X does not affect the likelihood of Y if lift = 1.