

8. (i) Show that $y^2 - 4y + 7$ is positive for all real values of y . (2)

(ii) Bobby claims that

$$e^{3x} \geq e^{2x} \quad x \in \mathbb{R}$$

Determine whether Bobby's claim is always true, sometimes true or never true, justifying your answer.

(2)

(iii) Elsa claims that

‘for $n \in \mathbb{Z}^+$, if n^2 is even, then n must be even’

Use proof by contradiction to show that Elsa's claim is true.

(2)

(iv) Ying claims that

‘the sum of two different irrational numbers is irrational’

Determine whether Ying's claim is always true, sometimes true or never true, justifying your answer.

(2)