(PB0107) Set $A = \{x \in \mathbf{R} : x^2 < 3\}$, $B = \{x \in \mathbf{Z} : x^2 < 3\}$ and $C = \{x \in \mathbf{R} : x^3 < 3\}$. For each statement below, either prove it or disprove it! Be careful with your logic and your exposition.

(a) $\frac{1}{2} \in A \cap B$.

(b) $\frac{1}{2} \in A \cup B$.

(c) $A \subseteq C$.

(d) $B \subseteq C$.

(e) $C \subseteq A \cup B$.

(f) $(A \cap B) \cup C = (A \cup B) \cap C$