1. Without a calculator, determine which of the numbers 
\[ 10^{30}, 10^{50}, 10^{70} \]
gives the best approximation to the value of the fraction \( \frac{100!}{(50!)^2} \). Justify your answer.

2. Prove that
   (i) \( n^2 + n + 1 = O(n^2) \),
   (ii) \( 3 \cdot 2^n + 100 = O(2^n) \),
   (iii) \( e^n + e^{n+1} = O(e^n) \).

3. Let \( A \) be the set \( \{\{1\}, \{2\}, \{3\}\} \).
   (i) How many elements does \( A \) have?
   (ii) Does \( A \) have a pair of different elements \( x, y \) such that \( x \subseteq y \)?
   (iii) How many subsets does \( A \) have?
   (iv) Does \( A \) have a pair of different subsets \( x, y \) such that \( x \subseteq y \)?
   Justify your answers.