(1) Prove that $n^2 \leq 2^n$ for all natural numbers $n \geq 4$. 
(2) Give an example of sets $A$ and $B$ such that $\mathcal{P}(A \cup B) \not\subseteq \mathcal{P}(A) \cup \mathcal{P}(B)$. Exhibit an element of $\mathcal{P}(A \cup B)$ that is not in $\mathcal{P}(A) \cup \mathcal{P}(B)$. 