1. Let $A$ and $B$ be two disjoint sets, that is, $A \cap B = \emptyset$, with cardinalities $|A| = n$ and $|B| = m$. Let $n \geq 4$ and $m \geq 4$. Answer each of the questions below. You do not have to justify your answers.
   (a) What is the cardinality of $A \cup B$? (10)
   (b) What is the cardinality of the cartesian product of $A$ and $B$? (10)
   (c) How many 4-element subsets of $A \times B$ are there? (20)
   (d) How many tuples of the form $(x_1, x_2)$ are there, where $x_1 \neq x_2$ and $x_1, x_2 \in A \cup B$. (20)
   (e) For a fixed $k \in \mathbb{N}_+$, how many $k$-tuples $(x_1, x_2, \ldots, x_k)$ are there, where each $x_i$ is a 3-element subset of $B$. Note that it is not required for the components of the tuple to be distinct. (20)
   (f) How many permutations are there of the powerset of $A$? (20)