

Answer the questions in the space provided below. You may use the back of the page if you need more space. Time: 15 minutes.

Name and section: \_\_\_\_\_

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  $(x_1, x_2, \dots, x_k)$  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)