Problem Set 12

Due: Thursday, March 19th

Instructions: Answer each of the following questions and provide a justification for your answer. In addition to the points assigned below, you will receive 0-2 writing points for the entire problem set.

1. Prove that
$$A \times (B \cap C) = (A \times B) \cap (A \times C).$$
2. Suppose that $A$and B are nonempty sets and $A \neq B$. Prove that $A \times B \neq B \times A$.
3. Let A and B be sets. Let $\sim_A$ be an equivalence relation on A. Let $\sim_B$ be an equivalence relation on B. Let $\sim$ be a relation on $A \times B$ such that $(a_1, b_1) \sim (a_2, b_2)$ if and only if $a_1 \sim_A a_2$ **and** $b_1 \sim_B b_2$.
   (a) Is $\sim$ always reflexive? If so prove it, and if not give counter example.
   (b) Is $\sim$ always symmetric? If so prove it, and if not give counter example.
   (c) Is $\sim$ always transitive? If so prove it, and if not give counter example.