Math 2326 - Introduction to Abstract Mathematics
Assignment 10 - Due Monday, February 11

Problem 37:

Let A, B, X and Y be sets. Prove that

$$(A \times B) \cap (X \times Y) = (A \cap X) \times (B \cap Y).$$

Problem 38:

Determine (with proof!) whether or not the following proposition is true.

Proposition. For all sets A and B, if $S \subset A \times B$ then $S = X \times Y$ for some sets X and Y with $X \subset A$ and $Y \subset B$.

Problem 39:

Let A, B, X and Y be sets. Prove that $(A \times B) \cup (X \times Y) \subset (A \cup X) \times (B \cup Y)$. Must the reverse inclusion also hold? Prove your assertion.

Problem 40:

If X is a set, recall that the *power set* of X is

$$\mathcal{P}(X) = \{Y \mid Y \text{ is a set and } Y \subset X\}.$$

a. Prove that for all sets A and B, $\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B)$.

b. Is the statement proven in part (a) still true if $\cap$ is replaced by $\cup$?