Prove the following propositions. Format your proof so each step of the proof is on its own line; each line should still be a complete sentence.

Proposition 1. Suppose $a, b, p \in \mathbb{Z}$ and p is prime. Prove that if $p|ab$, then $p|a$ or $p|b$. (Suggestion: Use the Proposition on page 152.)

Proof. □

Proposition 2. If A, B, and C are sets, then $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

Proof. □

Problem 3. Determine whether the following statement is true. If it is true, prove it; if it is false, give a disproof.

If $X \subseteq A \cup B$, then $X \subseteq A$ or $X \subseteq B$.

Solution. □