1. Let $A, B, C, D$ be points on line $l$. Prove or disprove by giving a counterexample for the following statements.

(a) If $A \ast B \ast C$ and $B \ast C \ast D$, then $A, B, C, D$ are distinct points, and $A \ast C \ast D$, $A \ast B \ast D$.

(b) If $A \ast B \ast C$ and $A \ast B \ast D$, then $A \ast C \ast D$ and $B \ast C \ast D$.

(c) If $A \ast C \ast D$ and $A \ast B \ast D$, then $A \ast B \ast C$ and $B \ast C \ast D$.

2. **Exterior Angle Theorem** says that the exterior angle of a triangle is larger than its two remote interior angles. Given a triangle $\triangle ABC$. Show that $\angle A < \angle B$ if and only if $BC < AC$. (Hint: Applying Exterior Angle Theorem)

3. Let $\mathbb{Q}^2$ be the rational plane of all ordered pairs $(x, y)$ of rational numbers, viewing elements of $\mathbb{Q}^2$ as points and the solution sets of linear equations $ax + by + c = 0$ as lines, where $a, b, c \in \mathbb{Q}$ are fixed constants. Show that Betweenness and Congruence Axioms are satisfied, except Congruence Axiom 1 and Dedekind’s Axiom.

4. Show that the interior of a triangle is nonempty.

5. Check if SAS can be replaced by ASA in the congruence axioms.