1. Let A, B and C be three points on a line such that $A * B * C$. Let E, F, and G be three other points on another line such that $\overline{EF} \simeq \overline{AB}$ and $\overline{EG}$ is congruent to $\overline{AC}$. Prove that $E * F * G$ and $\overline{FG}$ is congruent to $\overline{BC}$.

2. Let $\overline{AB}$ and $\overline{CD}$ be line segments. We say

$$\overline{AB} < \overline{CD}$$

if there is a point E with $C * E * D$ and $\overline{AB}$ is congruent to $\overline{CE}$. (i.e. $\overline{AB} \simeq \overline{CE}$). We also say $\overline{AB} > \overline{CD}$ if $\overline{CD} < \overline{AB}$.

a) Given line segments $\overline{AB}$ and $\overline{CD}$, show that exactly one of the following is true: $\overline{AB} < \overline{CD}$, $\overline{AB} \simeq \overline{CD}$, $\overline{AB} > \overline{CD}$.

b) Define the inside of a circle.

3. Stillwell 2.7.4

4. Stillwell 2.8.1

5. Stillwell 2.8.2

6. Stillwell 2.8.3

7. Stillwell 3.2.4

8. Consider lines $ax + by + c = 0$ and $a'x + b'y + c' = 0$. Show that the lines are parallel if and only if there is a constant $\lambda \neq 0$ such that $(a, b) = (\lambda a', \lambda b')$. Show that the lines are the same line if and only if there is a constant $\lambda \neq 0$ such that $(a, b, c) = (\lambda a', \lambda b', \lambda c')$.