SECTION 8.1 – Properties of Inequalities

Definition of Inequality: If *a* and *b* are two real numbers, then $a < b$ iff there is a positive number *p* such that $b = a + p$. If *a* and *b* are two real numbers, then $a > b$ iff $b < a$.

Theorem: If the same quantity is added to both sides of an inequality, then the sums are unequal and in the **same** order. $(a < b \Rightarrow a + c < b + c)$

Theorem: If equal quantities are added to unequal quantities, then the sums are unequal and in the **same** order. $(a < b \text{ and } c = d \Rightarrow a + c < b + d)$

Theorem: If unequal quantities are subtracted from equal quantities, then the differences are unequal but in the **opposite** order.
$(a < b \text{ and } c = d \Rightarrow c - a > d - b)$

Theorem: If both sides of an inequality are multiplied by a positive number, then the products are unequal and in the **same** order.
$(a < b \text{ and } c > 0 \Rightarrow ac < bc)$

Theorem: If both sides of an inequality are multiplied by a negative number, then the products are unequal but in the **opposite** order.
$(a < b \text{ and } c < 0 \Rightarrow ac > bc)$

Theorem: *Transitive Law of Inequalities* If $a < b$ and $b < c$, then $a < c$.

Theorem: If unequal quantities are added to unequal quantities in the same order, then the sums are unequal quantities in the **same** order.
$(a < b \text{ and } c < d \Rightarrow a + c < b + d)$

Theorem: In a triangle, an exterior angle is greater than either nonadjacent interior angle.

Given: $\triangle ABC$ with exterior $\sphericalangle 1$
Prove: $m\sphericalangle 1 > m\sphericalangle 2$ and $m\sphericalangle 1 > m\sphericalangle C$