Examlet 2 Advanced Geometry 3/13/13

1. a) State the definition of an *exterior angle* of a triangle.

   b) State the definition of $\sigma(\Delta ABC)$.

   c) State the definition of a *convex* quadrilateral.

2. a) State the Exterior Angle Theorem.

   b) State the Converse to the Isosceles Triangle Theorem.

   c) State the Scalene Inequality.

   d) State the Saccheri-Legendre Theorem.

   e) State Hilbert's Parallel Postulate.

3. State five conditions that are equivalent to the Euclidean Parallel Postulate.

4. Prove that if ℓ and ℓ' are two lines cut by a transversal t in such a way that a pair of alternate interior angles is congruent, then ℓ is parallel to ℓ'.

5. Provide good justifications in the blanks below for the corresponding statements:

Angle-Side-Angle Theorem: If two angles and the included side of one triangle are congruent to the corresponding parts of a second triangle, then the two triangles are congruent.

Restatement: If ΔABC and ΔDEF are two triangles such that ∠CAB ≅ ∠FDE, $\overline{AB} \cong \overline{DE}$, and ∠ABC ≅ ∠DEF, then ΔABC ≅ ΔDEF.

Statement:	Reason:
Let ΔABC and ΔDEF be two triangles such that ∠CAB ≅ ∠FDE, $\overline{AB} \cong \overline{DE}$, and ∠ABC ≅ ∠DEF	
There exists a point C′ on $\overrightarrow{AC}$ such that $\overline{AC'} \cong \overline{DF}$	
Now ΔABC′ ≅ ΔDEF	
and so ∠ABC′ ≅ ∠DEF.	
Since ∠ABC ≅ ∠DEF	by hypothesis
we can conclude ∠ABC ≅ ∠ABC′.	Transitive Property
Hence $\overrightarrow{BC} \cong \overrightarrow{BC'}$	
But $\overrightarrow{BC}$ can only intersect $\overleftrightarrow{AC}$ in at most one point	Theorem 3.1.7
so $C = C'$ and the proof is complete.	Because it's complete.