Discussion Problems

1. (Number 9 page 30 of Greenberg) Can you think of any way to prove from the postulates in chapter 1 that for every line \( l \)
   (a) There exists a point lying on \( l \)?
   (b) There exists a point not lying on \( l \)?

2. (Number 12 page 31 of Greenberg) What is the flaw in the ‘proof’ that all triangles are isosceles?

3. Determine if the following are tautologies.

   (a) \( p \implies (q \implies p) \)
   (b) \( [p \implies (q \implies r)] \implies [q \implies (p \implies r)] \)
   (c) \( (p \lor q) \iff (\neg p) \land (\neg q) \)
   (d) \( p \land \neg p \)
   (e) \( ((p \land \neg q) \implies (r \land \neg r)) \implies (p \implies q) \)

0.2 Outlined Problems (to be turned in with carefully written proofs)

On this assignment there are no proofs required for the following problem. Merely write out the definitions of the given terms.

1. Look up the definitions of the following geometric terms.

   (a) segment
   (b) endpoints of a segment
   (c) ray
   (d) angle
   (e) supplementary angles
   (f) right angle
   (g) parallel lines
   (h) perpendicular lines
   (i) circle
   (j) radius of a circle
   (k) transversal
0.3 Problems (to be turned in with proofs that your audience will find easy to follow)

1. Recall that a **model** of an axiomatic system is an interpretation of the undefined terms for which all of the axioms make sense and a **theorem** is a statement that can be justified using just the axioms (or previously proven theorems). Use the model ‘stacked cups’ model of the Scorpling Flug axiomatic system that we presented in class to conjecture an ‘unproved’, but true, fact about the flugs. Prove your conjecture.