Homework One, due September 1

1. Show that the incidence axioms hold in the standard model for Euclidean geometry.

2. Show that

$$\big((p \to q) \wedge (q \to r)\big) \to (p \to r)$$

is a tautology.

3. Let n be a positive integer n. All matrices we talk about below have either real or complex entries. A set G of matrices is called a **group** if

(i) $I \in G$;

(ii) If $A \in G$ and $B \in G$ then $AB \in G$;

(iii) If $A \in G$ then A is invertible and $A^{-1} \in G$.

Let

$$\mathbf{GL}(n)$$

be the set of invertible $n \times n$ matrices and note that it is a group. (It's called the **general linear group**. Let $\mathbf{A}(n)$ be the set of $(n+1) \times (n+1)$ matrices having the block form

$$\begin{bmatrix} A & a \\ 0 & 1 \end{bmatrix}$$

where $A \in \mathbf{GL}(n)$; a is an $n \times 1$ matrix; 0 is the $1 \times n$ matrix of all zeroes; and 1 is the 1×1 matrix whose entry is 1. Show that $\mathbf{A}(n)$ is a group. (It's called the **affine** group). Exhibit a formula for the inverse in this group.