

**Euclidean and Non-Euclidean Geometry (MATH 3210):  
some review problems**

- (1) State the axioms of neutral geometry in your own language.
- (2) Now write the axioms as formal sentences.
- (3) Give an example to show that  $\{I1, I2\} \not\models I3$ .
- (4) Draw examples of the isomorphism types of incidence geometries that have 5 points.
- (5) Assume the incidence and betweenness axioms. Suppose that  $A * B * C$  holds, and that all three of these points are incident to  $\ell$ . Explain why every point incident to  $\ell$  other than  $B$  lies on exactly one of the rays  $\overrightarrow{BA}$  or  $\overrightarrow{BC}$ .
- (6) Assume that  $\angle BAC$  is an angle and that  $B * D * C$ . Show that  $D$  is interior to  $\angle BAC$ .
- (7) Show that any point interior to two angles of a triangle is also interior to the third.
- (8) Describe what a field is, give two examples, and then describe how to construct the Cartesian plane over the field. (Say what the points are, the lines are, and describe when a point lies on a line.)