

HOMework 7 FOR MATH 444A, WINTER 2013

DUE WEDNESDAY, FEBRUARY 27

Problem 1. Let ℓ be a line, and let A, B, C be three distinct noncollinear points on the same side of ℓ . Prove that the triangle ABC lies on one side of ℓ (look up the definition of a triangle in Chapter 5).

Problem 2.

- (1) Find a configuration of 9 points and 9 lines on the plane such that every line contains exactly three points (of the chosen 9) and every point lies on exactly 3 lines (of the chosen 9).
- (2) (**Bonus problem.**) Show that the “Fano plane” does not exist in Euclidean geometry: namely, there do not exist 7 points and 7 lines on the plane such that every one of those lines contains exactly three of the chosen points and every one of the seven points lies on exactly three of the lines.

Problem 3: The map problem. The plane is divided into regions by n (straight) lines. Prove that you can color the regions in two colors so that no two neighboring regions are of the same color.