— M436 — Homework Assignment 2 —

Due: Friday, September 12, in class.

Each problem is worth 20 points. Please show all your work.

Exercise 1

The Cremona-Richmond configuration can be defined as follows: The points are the 15 unordered pairs of the numbers $1, \ldots, 6$ like $(2,4)$, lines are unordered triples of three points that contain the numbers $1, \ldots, 6$ like, like $\{(1,6),(2,3),(4,5)\}$. Complete labeling the figure with points to show that this configuration of type 15_3 can be realized in the Euclidean plane.

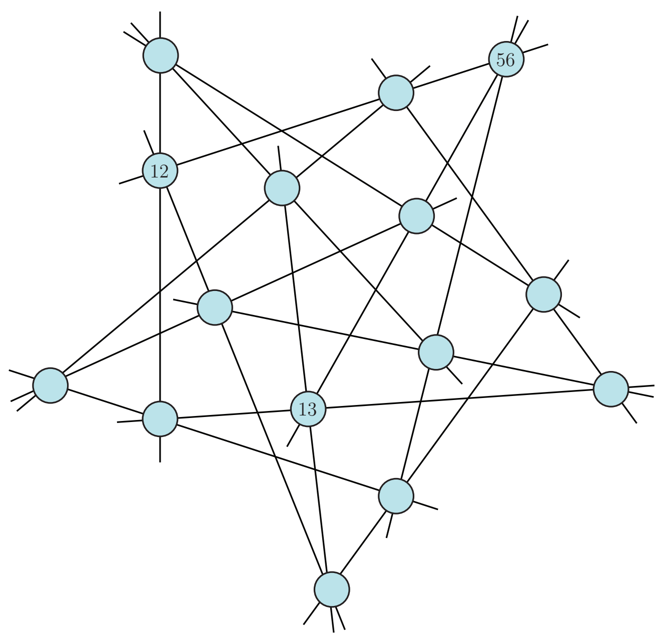

Figure 1 The Cremona-Richmond configuration

Exercise 2

Is the configuration in **Figure 2** isomorphic to the Pappus configuration? Justify your decision.

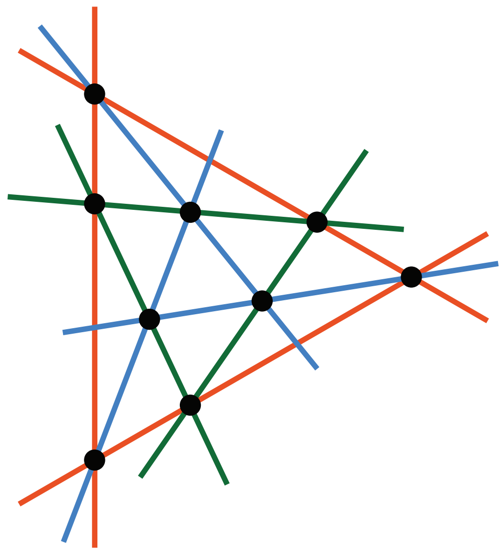

Figure 2 A 9_3-configuration

Exercise 3

In a parallelogram $abcd$ the edge bc is divided by e in the proportion $2:1$, and thew edge ad is divided by f in the proportion $2:3$. Determine in what proportions the segments ae and bf intersect each other.

Exercise 4

Consider the triangle $\Delta(p_1p_2p_3)$ with

$$p_1 = (1, -1) \qquad p_2 = (4, 1) \qquad p_3 = (2, 3)$$

and the line through $(4, -9)$ and $(1, 19)$. Compute the ratios r_i with which this line intersects the three lines p_1p_2, p_2p_3 and p_3p_1. Then compute $r_1r_2r_3$.

Exercise 5

Let six points on the unit circle as $p_1 = (-4/5, -3/5)$, $p_2 = (5/13, -12/13)$, $p_3(4/5, -3/5)$ and $q_1 = (-3/5, 4/5)$, $q_2 = (0, 1)$, $q_3 = (4/5, 3/5)$. Denote the intersection of the two lines p_iq_j and p_jq_i by r_{ij} for $i \neq j$. Compute the coordinates of r_{12}, r_{13} and r_{23}, and show that the three points are collinear.