Homework 3 (due 3/16)

1. Determine the Point of $\mathbb{RP}^2$ at which the Line through the Points $[1, 2, -3]$ and $[2, -1, 0]$ meets the Line through the Points $[1, 0, -1]$ and $[1, 1, 1]$.

2. Let
$$t : [x, y, z] \mapsto [2x + y, -x + z, y + z],$$
be projective transformation from $\mathbb{RP}^2$ to $\mathbb{RP}^2$. Find the image of the Line $x + 2y + 3z = 0$ under the projective transformation t.

3. Determine the projective transformation that map the Points $[-2, 0, 1]$, $[0, 1, -1]$, $[-1, 2, -1]$, $[-1, 1, -1]$ to the Points $[0, 1, 0]$, $[1, 0, 0]$, $[-1, -1, 1]$, $[2, 1, 1]$, respectively.

4. An aerial camera photographs a car traveling along a straight road on flat ground towards a junction. Before the junction there are two warning signs, at distances of 2 km and 3 km from the junction. On the film the signs are 4 cm and 6 cm from the junction, and the car is 1 cm from the junction. How far is the car from the junction on the ground?