MAT402 Classical Geometries, Fall 2016. Problem set 6

John Lee's textbook: review Chapter 3; read Chapter 4 ("angles", "betweenness of rays", "interior of an angle").

This problem set is due in class on Tuesday Nov.1st. You are encouraged to work in a group, but you must write your solution later, separately, on your own.

- If you worked in a group, please indicate with whom you worked.
- Copy the following sentence, and sign it when you're done preparing your submission: "I declare that I wrote these solutions entirely on my own."

(1) Textbook p.81–82 Exercise 3B (insufficient conditions on four points)

(2) Textbook p.81–82 Exercise 3D (arrangement of four points)

(3) Textbook p.81–82 Exercise 3E (intersection of segments with a common endpoint).

(4) Textbook p.81–82 Exercise 3G (on a line, equidistant points from a given point)

(5) Textbook p.81–82 Exercise 3I (coordinate representation of a ray)

(6) Textbook p.81–82 Exercise 3K (segment cutoff theorem = segment subtraction)

A couple of more practice questions on earlier material – don't hand them in:

- Prove, from the axioms of incidence geometry:
  - Every point lies on at least two distinct lines.
  - For any two (not necessarily distinct) points, there exists a line that passes through both of them.
  - For any two distinct points A and B, there exists a line that passes through A and not through B.
- Consider the central projection with respect to the origin to the plane $\{x_1 + x_2 = 1\}$ in $\mathbb{R}^3$. Find the image of the point (a, b, c). When is this image not well defined? (Hint: look for λ such that $\lambda(a, b, c)$ is in the plane.)