

**Instructions**

- Answer each question completely; justify your answers.
  - This assignment is due at 17:00 on Tuesday February 10th in Assignment Box #37.
1. Another way of defining a projective plane is as a set  $X$  of points and a set  $\mathcal{A}$  of subsets of  $X$  called lines such that the following three axioms hold:
    - (a) Given any two points, there is exactly one line that contains both of them;
    - (b) Given any two lines, there is exactly one point that is contained in both of them;
    - (c) There is a subset of  $X$  consisting of 4 points, no three of which are collinear.

Prove that under these axioms, every line of the design  $(X, \mathcal{A})$  contains  $n + 1$  points for some parameter  $n$ .

2. Exercise 2.2.
3. Exercise 2.6.
4. Exercise 2.9, parts (a), (c) and (e).