

## MA 341 — Homework #3

Due Friday, September 19, in class

1. Find an example of two lines,  $\ell_1$  and  $\ell_2$ , satisfying all of the following properties:
  - (a)  $\ell_1$  is described by an equation of the form  $a_1x + b_1y = c_1$  and  $\ell_2$  is described by an equation of the form  $a_2x + b_2y = c_2$ , where  $a_1, a_2, b_1, b_2, c_1, c_2$  are all integers.
  - (b) The lines  $\ell_1$  and  $\ell_2$  do not have the same slope.
  - (c) The two lines intersect in a point  $P(x, y)$  such that  $x$  and  $y$  are not both integers.
2. Refer to the handout on Geometrical Worlds. Use the solution to problem 1, above, of this homework, to explain why for the Integer Plane (2.2.3 on the handout) property 2 at the beginning of the handout is false.

**The remaining questions refer to the handout on Geometrical Worlds. In each case, determine whether properties 1 and 2 at the beginning of the handout are true or false, providing justification.**

3. The Sphere, 2.2.4.
4. The Inside-Out Plane 2.2.7. (GeoGebra is very helpful for explorations.)
5. The Klein Disk, 2.2.9. (GeoGebra is very helpful for explorations.)
6. The Projective Plane, 2.2.12.