

**Math 4060 (Cherry) OPTIONAL EXTRA CREDIT Homework Assignment #28**

Due Friday, April 21

Do none, one, the other, or both of the following problems for optional extra credit.

Let  $\ell$  and  $n$  be two different lines in  $\mathbf{R}^2$ . Let  $\rho_\ell$  denote reflection through  $\ell$  and  $\rho_n$  denote reflection through  $n$ .

1. We said in class that if  $\ell$  and  $n$  are *parallel*, then  $\rho_n \circ \rho_\ell$  is a translation. Find two lines  $\ell$  and  $n$  such that  $\rho_n \circ \rho_\ell$  is translation by one unit to the right, *i.e.*,

$$(x, y) \mapsto (x + 1, y).$$

*Hint:* You can take  $\ell$  to be the  $y$ -axis. Find  $n$ .

2. We said in class that if  $\ell$  and  $n$  *intersect* in a point  $O$ , then  $\rho_n \circ \rho_\ell$  is a rotation around the point  $O$ . Find two lines  $\ell$  and  $n$  such that  $\rho_n \circ \rho_\ell$  rotates the plane  $\mathbf{R}^2$   $60^\circ$  counterclockwise around the origin  $O = (0, 0)$ . *Hint:* You can take  $\ell$  to be the  $x$ -axis. Find  $n$ .