

## Math 130 Homework 6

### Reading:

- Stillwell, chapter 5.
- On anamorphosis (drawing with forced perspective) in art:  
<https://en.wikipedia.org/wiki/Anamorphosis>  
(this could lead to a good independent project if you're interested)

1. Do the following problems from S4P: 5.5.1-5.5.3
2. The set of functions from  $\mathbb{R}$  to  $\mathbb{R}$  of the form  $f(x) = ax + b$ , where  $a, b \in \mathbb{R}$ ,  $a \neq 0$  is called the *affine transformations*. Deduce from what you have shown in problem 1 that the affine transformations form a *group*.
3. Do the following problems from S4P: 5.6.1-5.6.4
4. Does the set of linear fractional functions form a group? Explain.
5. 5.7.1-5.7.2 (we'll cover this material on Thursday)
6. Let  $[p, q; r, s] = \frac{(r-p)(s-q)}{(r-q)(s-p)}$ .
  - (a) Show that  $[p, q; r, s][p, q; s, r] = 1$
  - (b) For which other permutations of the inputs is  $[p, q; r, s][?, ?; ?, ?] = 1$  (i.e. fill in the “?”s with  $p, q, r$ , and  $s$ )
  - (c) What is the relationship between  $[p, q; r, s]$  and  $[p, r; q, s]$ ?
  - (d) For which other permutations of the inputs does the relationship in part c) hold?