# 11 Monday

1. By any means necessary fill out the following table:

| $f$ | $f(2,0)$ | $f(0,3)$ | $f(2,3)$ | $f(-6,0)$ |
|---|---|---|---|---|
| $(x,y) \mapsto (\frac{3}{5}x - \frac{4}{5}y, \frac{4}{5}x + \frac{3}{5}y)$ | | | | |
| $(x,y) \mapsto (-\frac{3}{5}x + \frac{4}{5}y, \frac{4}{5}x + \frac{3}{5}y)$ | | | | |
| $(x,y) \mapsto (-2x, \frac{1}{2}y)$ | | | | |
| $(x,y) \mapsto (y,x)$ | | | | |
| $(x,y) \mapsto (x+2, y+1)$ | | | | |
| $(x,y) \mapsto (-x,y)$ | | | | |
| $(x,y) \mapsto (2x,2y)$ | | | | |
| $(x,y) \mapsto (x-y+1, -x+y-2)$ | | | | |

There seem to be two types of maps present. From your work, try to distinguish the two categories. Can you write a generilized statement and prove any of the claims you make?

2. Vectors and linear combinations

    1. Draw the following segments. What do they have in common? from $(3, -1)$ to $(10, 3)$; from $(1.3, 0.8)$ to $(8.3, 4.8)$; from $(\pi, \sqrt{2})$ to $(7 + \pi, 4 + \sqrt{2})$

        (a) Find another example of a directed segment that represents this vector. The initial point of your segment is called the tail of the vector, and the final point is called the head.

        (b) Which of the following directed segments represents $\begin{bmatrix} 7 \\ 4 \end{bmatrix}$? from $(-2, -3)$ to $(5, -1)$; from $(-3. - 2)$ to $(11, 6)$; from $(10, 5)$ to $(3, 1)$; from $(-7, -4)$ to $(0, 0)$?

        (c) Brief discussion

    2. Given the vector $\begin{bmatrix} -5 \\ 12 \end{bmatrix}$, find the following vectors:

        (a) same direction, twice as long

        (b) same direction, length 1

        (c) opposite direction, length 10

        (d) opposite direction, length c

    3. Addition of vectors

    4. Real vector spaces - definition

3. Directions

    - Through the origin
    - Linear independence
    - Generalized directions
    - Parallels

4. Vector Thales

5. Prove: Diagonals of parallelogram bisect each other

6. Centroid of a triangle