HOMEWORK 5 - DUE FRIDAY, NOV. 12

1.) Let $T : \mathbb{R}^3 \mapsto \mathbb{R}^3$ be a linear transformation whose matrix $A_{T,\{e_1,e_2,e_3\}}$ with respect to the standard basis is:

$$\begin{bmatrix} 1 & -1 & 0 \\ 2 & 0 & 3 \\ 0 & 1 & 4 \end{bmatrix}$$

Write down the matrix $A_{T,\{f_1,f_2,f_3\}}$of T with respect to the basis $f_1 = (1,-1,0)$, $f_2 = (2,2,1)$, $f_3 = (0,2,-2)$.

2.) Let V be the vector space of polynomials of degree ≤ 2 in x, and $T = d/dx$ the operator of differentiation. Show that T is a linear transformation and write down the matrix of T with respect to the basis $1+x, 2x, 3x^2-1$.

3.) a) Let T be a linear transformation $T : \mathbb{R}^2 \mapsto \mathbb{R}^2$ given by reflection in the line $y = 3x$. Write down the matrix $A_{T,\{e_1,e_2\}}$ with respect to the standard basis.
b) Do the same with T being the projection onto the line $y = x$ (the projection yields the component of a vector parallel to the line $y = x$).

1. Suggested problems - not to be handed in

Strang: 2.6.7, 2.6.10, 2.26, 4.2.13, 4.2.17, 4.3.5, 4.3.8.