Problem Set 4

Problem 1. *(2020 Fall Midterm - 10 points)Let $E = \{u_1, u_2, u_3\}$ and $F = \{v_1, v_2\}$, where*

$$u_1 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}, u_2 = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, u_3 = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}, v_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}, v_2 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$$

Define the linear transformation $T : \mathbb{R}^3 \to \mathbb{R}^2$ by

$$T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} 2x_2 \\ -x_1 \end{bmatrix}$$

Find the matrix A representing T with respect to the ordered bases E and F.

Problem 2. *(2020 Fall Midterm - 8 points)Three planes* Π_1, Π_2, Π_3 *are given by the equations*

$$\Pi_1 : x + y + z = 0$$

$$\Pi_2 : 2x - y + 4z = 0$$

$$\Pi_3 : -x + 2y - z = 0$$

Determine a matrix representative (in the standard basis of $\mathbb{R}^3$*) of a linear transformation taking the* xy *plane to* Π_1*, the* yz *plane to* Π_2 *and the* zx *plane to* Π_3*.*