An Example with Matrices as Vectors

This leads to the linear system

$$c_0 + c_1 + c_2 + c_3 = 2, c_1 + c_2 + c_3 = 3, c_2 + c_3 = 4, c_3 = 5$$

This you can solve by G-E (actually just back substitution): $c_0 = -1, c_1 = -1, c_2 = -1, c_3 = 5$. Therefore we have the following coordinate vectors for our polynomial:

$$[2 + 3t + 4t^2 + 5t^3]_E = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 5 \end{bmatrix} \quad \text{and} \quad [2 + 3t + 4t^2 + 5t^3]_F = \begin{bmatrix} -1 \\ -1 \\ -1 \\ 5 \end{bmatrix}$$

Ex: In this example $V = \mathbb{R}^{2\times 2}$. The **standard basis** here is taken to be $E = (e_1, e_2, e_3, e_4)$ where

$$e_1 = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, e_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, e_3 = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, e_4 = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$$