Assignment-11

Satyam Singh
EE20MTECH14015

***Abstract*—This assignment deals with linear dependence.**

Download tex file from

https://github.com/satyam463/Assignment−11/blob/main/Assignment%2011.tex

1 Problem Statement

Are the vectors

$$\alpha_1 = \brak{1,1,2,4}, \alpha_2 = \brak{2,-1,-5,2} \tag{1.0.1}$$

$$\alpha_3 = \brak{1,-1,-4,0}, \alpha_4 = \brak{2,1,1,6} \tag{1.0.2}$$

linearly independent in R^4

2 Solution

consider the row reduced matrix

$$\myvec{1 & 1 & 2 & 4\\ 2 & -1 & -5 & 2\\ 1 & -1 & -4 & 0\\ 2 & 1 & 1 & 6} \xleftrightarrow[R_3 \to R_3 - R_1]{R_2 \to R_2 - 2R_1} \myvec{1 & 1 & 2 & 4\\ 0 & -3 & -9 & -6\\ 0 & -2 & -6 & -4\\ 2 & 1 & 1 & 6} \tag{2.0.1}$$

$$\xleftrightarrow[R_2 \leftarrow R_4]{R_4 \leftarrow R_4 - 2R_1} \myvec{1 & 1 & 2 & 4\\ 0 & -1 & -3 & -2\\ 0 & -2 & -6 & -4\\ 0 & -3 & -9 & -6} \tag{2.0.2}$$

$$\xleftrightarrow[R_2 \leftarrow -R_2]{R_4 \leftarrow R_2} \myvec{1 & 1 & 2 & 4\\ 0 & 1 & 3 & 2\\ 0 & -3 & -9 & -6\\ 0 & -2 & -6 & -4} \tag{2.0.3}$$

$$\xleftrightarrow[R_4 \leftarrow R_4 + 2R_2]{R_3 \leftarrow R_3 + 3R_2} \myvec{1 & 1 & 2 & 4\\ 0 & 1 & 3 & 2\\ 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0} \tag{2.0.4}$$

Therefore the rank = no. of pivot columns = 2 (less than no. of columns).Thus the fours vectors are not linearly independent.