

For these problems define $\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $\vec{v}_3 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$, $B = \{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$, and $[B] = [\vec{v}_1 \ \vec{v}_2 \ \vec{v}_3]$.

Note that B is a basis for the vector space \mathbb{R}^3 and $[B]$ is a 3×3 matrix whose columns are the vectors \vec{v}_1 , \vec{v}_2 , and \vec{v}_3 .

1) Find the linear combination $2\vec{v}_1 - 3\vec{v}_2 + \vec{v}_3$

2) Given the vector $\vec{x}_B = \begin{bmatrix} 2 \\ -3 \\ 1 \end{bmatrix}_B$, find \vec{x}_S .

3) If we were to row reduce $[B]$, how many rows would have a pivot?

4) What is $\dim(\text{RS}([B]))$?

5) How many solutions does $[B]\vec{x} = \vec{0}$ have?