**Source**:

# 1 | Row Reduced Echelon Form

Null space is the same (because algebra). Then turn it into a system of equations and use those equations to find the null space.

# 2 | Factoring a vector

Say we have $\begin{pmatrix} -2x_3 - 4x_4 \\ -4x_3 - 7x_4 \\ x_3 \\ x_4 \end{pmatrix}$. Then you can write it as the linear combination

$$\begin{pmatrix} -2x_3 \\ -4x_3 \\ x_3 \\ 0 \end{pmatrix} + \begin{pmatrix} -4x_4 \\ -7x_4 \\ 0 \\ x_4 \end{pmatrix} = x_3 \begin{pmatrix} -2 \\ -4 \\ 1 \\ 0 \end{pmatrix} + x_4 \begin{pmatrix} -4 \\ -7 \\ 0 \\ 1 \end{pmatrix}$$

# 3 | #icr 3.C icr

## 3.1 | Matrix Definition

Old news (but lots of subscripts)

## 3.2 | Making a matrix from a map

Based on maps being uniquely determined

## 3.3 | Matrix addition and scalar multiplication

Not news

## 3.4 | The matrix for the derivative map (finite)

$$T \in \mathcal{L}\left(\mathcal{P}_5\left(\mathbb{R}\right), \mathcal{P}_4\left(\mathbb{R}\right)\right)$$

Start with standard bases: $\mathcal{P}_5 \to 1, x, x^2, x^3, x^4, x^5$, $\mathcal{P}_4 \to 1, x, x^2, x^3, x^4$ Now lets define the map:

$$\begin{aligned} T1 &= 0 \\ Tx &= 1 \\ Tx^2 &= 2x \\ Tx^3 &= 3x^2 \\ Tx^4 &= 4x^3 \\ Tx^5 &= 5x^4 \end{aligned}$$