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: $\mathcal{P}_5 \to 1, x, x^2, x^3, x^4, x^5$, $\mathcal{P}_4 \to 1, x, x^2, x^3, x^4$