

Bases and Rank Theorem WORKSHEET

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Let's analyse 3×4 matrix $A = \begin{bmatrix} 1 & 2 & 1 & 0 \\ -1 & -2 & 2 & 3 \\ 0 & 0 & 5 & 5 \end{bmatrix}$

A) Find a basis for $\text{Col } A$: (use the systematic procedure you've been taught)

What is $\dim \text{Col } A$?

Of what space is $\text{Col } A$ a subspace?

B) Find a basis for $\text{Nul } A$:

What is $\dim \text{Nul } A$?

Of what space is $\text{Nul } A$ a subspace?

C) Why is $\dim \text{Col } A + \dim \text{Nul } A = n$ (number of columns) for any A ?

D) Find a basis for $\text{Row } A$:

Does $\dim \text{Row } A = \text{rank } A$? (always? why?)

Of what space is $\text{Row } A$ a subspace?

BONUS: Why do all vectors in $\text{Nul } A$ have zero dot product with all vectors in $\text{Row } A$? (this is called orthogonal)

