IF TV SCIENCE WAS MORE LIKE REAL SCIENCE

GERIAL KILLERS WOULD HAVE PLENTY OF TIME TO GET AWAY.
SUCH RICH PLOT LINES FOR TV LOSSES ARE A FANTASY.

SPECIAL AGENTS WOULD NEVER FIGURE OUT WHO THE VILLAIN IS.
WE RECONSTRUCTED THE NAME FROM A WOODEN PENCIL!
TURNING IT INTO DRAMA IS THE MUG.

MYTH DEBUNKING WOULD NEVER GET PAST PEER REVIEW.
WHAT DO YOU MEAN ONE DATA POINT IS NOT ENOUGH?

ROBOTS WOULD NEVER TAKE OVER THE WORLD.
IF WOULD WORK FOR A SECOND ARMS!

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Announcements

• Tuesday 11/11 is a holiday so no section or office hours
• If you’re in the Tues evening section, please try and make it to one of the other sections this week
• Matlab section should be doable on your own if you can’t make it though (everything is self-contained)
Consider the matrix A below. What vector spaces are the nullspace of A (Nul A), and column space of A (Col A) subspaces of?

\[
A = \begin{bmatrix}
1 & 5 & 0 \\
2 & 1 & 2 \\
2 & 6 & 1 \\
3 & 1 & 0 \\
1 & 0 & 5 \\
\end{bmatrix}
\]

A: Col A a subspace of \( \mathbb{R}^3 \)  
Nul A a subspace of \( \mathbb{R}^3 \)  

B: Col A a subspace of \( \mathbb{R}^3 \)  
Nul A a subspace of \( \mathbb{R}^5 \)  

C: Col A a subspace of \( \mathbb{R}^5 \)  
Nul A a subspace of \( \mathbb{R}^3 \)  

D: Col A a subspace of \( \mathbb{R}^5 \)  
Nul A a subspace of \( \mathbb{R}^5 \)  

Answer: C - the column space is composed of linear combinations of the columns of the matrix. The columns of the matrix live in \( \mathbb{R}^5 \), so thus the column space is a subspace of \( \mathbb{R}^5 \). The null space is a subspace composed of solutions to the equation \( Ax = 0 \). Such solutions, \( x \), must have three components, one for each column in A, so the null space is a subspace of \( \mathbb{R}^3 \).
iClicker question #2

What is a basis for the column space of the following matrix?

\[
\begin{bmatrix}
1 & 2 & 0 & 4 & 0 \\
0 & 0 & 1 & -2 & 0 \\
0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0
\end{bmatrix}
\]

A: \{\begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}\} 

B: \{\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}\}

C: \{\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}\} 

D: \{\begin{bmatrix} 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 0 \\ 0 \end{bmatrix}\}

Answer: C - The pivot columns of a matrix compose a basis for the column space. The other columns of the matrix can be written as linear combinations of the pivot columns.

**Careful** - the columns of rref(A) are not the same as the columns of A in general. You figure out which columns are linearly independent by looking at rref(A), but the columns that are in col(A) are the columns of the original matrix, A. In this specific case, the matrix given is already row-reduced so there’s no difference here.