21-241 – Homework assignment week #7

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Reminder

Homework will be given on Fridays and due on the next Friday before 5pm, to me in class or in Andrew Zucker's mailbox in Wean Hall 6113. Late homework will never be accepted without a proper reason. In case of physical absence, electronic submissions by e-mail to both me and Andrew Zucker can be accepted. Please do not forget to write your name, andrew id and section and please use a staple if you have several sheets.

Reading

- Poole : Sec. 3.5, especially the proof of Theorem 3.27.

Exercises (20 pts)

Ex 1 (9 pts)

Compute bases for row(A), col(A) and null(A) when

$$A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & -1 & 1 \\ 0 & 1 & -1 & -1 \end{bmatrix} \qquad A = \begin{bmatrix} 2 & -4 & 0 & 2 & 1 \\ -1 & 2 & 1 & 2 & 3 \\ 1 & -2 & 1 & 4 & 4 \end{bmatrix}$$

Ex 2 (3 pts)

Find a basis for the span of

$$\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix}$$

Ex 3 (5 pts)

Answer the following without doing any matrix computations.

1. Do $\begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}, \begin{bmatrix} -1 \\ 5 \\ 1 \end{bmatrix}$ form a basis of $\mathbb{R}^3$?
2. If A is a 3×5 matrix, explain why the columns of A must be linearly dependant.
3. If A is a 4×2 matrix, explain why the rows of A must be linearly dependant.
4. If A is a 3×5 matrix, what are the possible values of nullity(A) ?
5. If A is a 4×2 matrix, what are the possible values of nullity(A) ?

Ex 4 (3 pts)

Do

$$\begin{bmatrix} 1 \\ -1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} -1 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

form a basis of $\mathbb{R}^4$?