Week 5 Conceptual Quiz

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Section: MATH301 001

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Problem 1. **(2 points)**
Let A be the matrix

$$A = \begin{bmatrix} 4 & 0 & -7 & 1 \\ -3 & 1 & 5 & -9 \\ -6 & -2 & 0 & 7 \\ -1 & -8 & -1 & -4 \end{bmatrix}.$$

Notice that

$$\begin{bmatrix} -14 \\ 38 \\ 34 \\ -38 \end{bmatrix} = 6\begin{bmatrix} -3 \\ 1 \\ 5 \\ -9 \end{bmatrix} - 4\begin{bmatrix} -1 \\ -8 \\ -1 \\ -4 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} -21 \\ 20 \\ -10 \\ -43 \end{bmatrix} = 5\begin{bmatrix} 0 \\ 1 \\ -2 \\ -8 \end{bmatrix} + 3\begin{bmatrix} -7 \\ 5 \\ 0 \\ -1 \end{bmatrix}$$

Which subspace associated with A is $\begin{bmatrix} -14 \\ 38 \\ 34 \\ -38 \end{bmatrix}$ contained in?

- A. $\text{col}(A)$
- B. $\text{row}(A)$
- C. $\text{null}(A)$
- D. None of the above

Which subspace associated with A is $\begin{bmatrix} -21 \\ 20 \\ -10 \\ -43 \end{bmatrix}$ contained in?

- A. $\text{null}(A)$
- B. $\text{col}(A)$
- C. $\text{row}(A)$
- D. None of the above

Correct Answers:

- B
- B

Problem 2. **(1 point)**
Let A be the matrix

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

Which of the following vectors are in the null space of A? Select all that apply. (Hint: you don't need to figure out what the null space of A is, you can individually check whether each vector is in the null space)

- A. $\begin{bmatrix} -4 \\ 0 \\ -14 \\ -16 \end{bmatrix}$
- B. $\begin{bmatrix} 6 \\ 12 \\ 6 \\ -6 \end{bmatrix}$
- C. $\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$
- D. $\begin{bmatrix} -3 \\ -3 \\ -12 \\ -15 \end{bmatrix}$
- E. $\begin{bmatrix} -3 \\ 9 \\ -15 \\ -3 \end{bmatrix}$
- F. None of the above are in the null space of A.

Correct Answers:

- ACD

Problem 3. **(1 point)**
Let A be a matrix with 5 rows and 7 columns. Supposed that the dimension of the row space of A is 2.

What is the dimension of the column space of A?

- A. 2
- B. 5
- C. 0
- D. 3
- E. We don't have enough information to know what the dimension of the column space of A is.

What is the dimension of the null space of A?

- A. 0
- B. 2
- C. 5
- D. 3
- E. We don't have enough information to know what the dimension of the column space of A is.

Correct Answers:

- A
- C

Problem 4. **(1 point)**
Let A be a matrix with 9 rows and 11 columns. Supposed that the dimension of the null space of A is 7.

What is the dimension of the column space of A?

- A. 5
- B. 2
- C. 4
- D. 7
- E. We don't have enough information to know what the dimension of the column space of A is.

What is the dimension of the row space of A?

- A. 4
- B. 5
- C. 7
- D. 2
- E. We don't have enough information to know what the dimension of the row space of A is.

Correct Answers:

- C
- A