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Quiz-1

Max. Time: 20 min **Max. Points: 20**

Note: Solve all parts. Limit your written responses to the provided space.

Q.1. [8] Choose by putting a check mark on the most appropriate option. Note: No cutting/overwriting allowed.

i. It is not impossible to row reduce a given matrix to different reduced echelon forms, using different sequences of row operations.

(A) True (B) False

ii. The equation $\mathbf{Ax} = \mathbf{b}$ is referred to as vector equation.

(A) True (B) False

iii. The equation $\mathbf{Ax} = \mathbf{b}$ is consistent if the matrix $\mathbf{A}$, which is $m \times n$, has a pivot position in every row.

(A) True (B) False

iv. If $\mathbf{A}$ is an $m \times n$ matrix whose columns do not span $\mathbb{R}^m$, then the equation $\mathbf{Ax} = \mathbf{b}$ is consistent for some $\mathbf{b}$ in $\mathbb{R}^m$.

(A) True (B) False

v. A homogeneous system is not always consistent.

(A) True (B) False

vi. If $\mathbf{x}$ is a nontrivial solution of $\mathbf{Ax} = \mathbf{0}$, then every entry in $\mathbf{x}$ is nonzero.

(A) True (B) False

vii. The effect of adding $\mathbf{p}$ to a vector $\mathbf{v}$ is to move $\mathbf{v}$ in a direction parallel to $\mathbf{v}$.

(A) True (B) False

viii. The equation $\mathbf{x} = \mathbf{p} + t\mathbf{v}$ describes a line through $\mathbf{v}$ parallel to $\mathbf{p}$.

(A) True (B) False

Q.2. [7+5]

a) Row reduce the following matrix to reduced echelon form.

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

Solution: See Example 2 on page 14 in the textbook.

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b) Let $\mathbf{A} = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}$, and $\mathbf{b} = \begin{bmatrix} 10 \\ 3 \\ 3 \end{bmatrix}$. Is **b** in the span of the columns of **A**?

Solution: Reduce [A b] to echelon form.

$$[\mathbf{A}\ \ \mathbf{b}] = \begin{bmatrix} 2 & 0 & 6 & 10 \\ -1 & 8 & 5 & 3 \\ 1 & -2 & 1 & 3 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 3 & 5 \\ -1 & 8 & 5 & 3 \\ 1 & -2 & 1 & 3 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 3 & 5 \\ 0 & 8 & 8 & 8 \\ 1 & -2 & -2 & -2 \end{bmatrix} \sim \begin{bmatrix} 1 & 0 & 3 & 5 \\ 0 & 8 & 8 & 8 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Since $[\mathbf{A}\ \ \mathbf{b}]$ is consistent, therefore, **b** is in the span of the columns of **A.**

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