

# National University of Computer & Emerging Sciences Islamabad

FAST School of Computing

Fall-2024

Islamabad Campus

## MT1004 – Linear Algebra

### Quiz # 2

Name: ----- Roll no: ----- Section: --- Date: -----

Let  $A = \begin{bmatrix} 1 & 0 & 5 \\ -2 & 1 & -6 \\ 0 & 2 & 8 \end{bmatrix}$  and  $\mathbf{b} = \begin{bmatrix} 2 \\ -1 \\ 6 \end{bmatrix}$ .

- i) Is  $\mathbf{b}$  in the subset of  $\mathbb{R}^3$  spanned by the columns of  $A$ ?
- ii) Does the equation  $A\mathbf{x} = \mathbf{y}$  have a solution for each  $\mathbf{y}$  in  $\mathbb{R}^3$ ? Why or why not?
- iii) Do the columns of  $A$  span  $\mathbb{R}^3$ ? Why or why not?
- iv) Find the general equation of the plane spanned by the first two columns of  $A$ .

(Hint: Let  $\mathbf{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  is in the span of first two columns of  $A$ . Write  $\mathbf{u}$  as the linear combination of first two columns of  $A$  and then form an equation in terms of  $x$ ,  $y$  and  $z$ .)

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Let  $A = \begin{bmatrix} 1 & 0 & -4 \\ 0 & 3 & -2 \\ -2 & 6 & 3 \end{bmatrix}$  and  $\mathbf{b} = \begin{bmatrix} 4 \\ 1 \\ -4 \end{bmatrix}$ .

- i) Is  $\mathbf{b}$  in the subset of  $\mathbb{R}^3$  spanned by the columns of  $A$ ?
- ii) Does the equation  $A\mathbf{x} = \mathbf{y}$  have a solution for each  $\mathbf{y}$  in  $\mathbb{R}^3$ ? Why or why not?
- iii) Do the columns of  $A$  span  $\mathbb{R}^3$ ? Why or why not?
- iv) Find the general equation of the plane spanned by the first two columns of  $A$ .

(Hint: Let  $\mathbf{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  is in the span of first two columns of  $A$ . Write  $\mathbf{u}$  as the linear combination of first two columns of  $A$  and then form an equation in terms of  $x$ ,  $y$  and  $z$ .)

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Let  $A = \begin{bmatrix} 1 & -2 & -6 \\ 0 & 3 & 7 \\ 1 & -2 & 5 \end{bmatrix}$  and  $\mathbf{b} = \begin{bmatrix} 11 \\ -5 \\ 9 \end{bmatrix}$ .

- i) Is  $\mathbf{b}$  in the subset of  $\mathbb{R}^3$  spanned by the columns of  $A$ ?
- ii) Does the equation  $A\mathbf{x} = \mathbf{y}$  have a solution for each  $\mathbf{y}$  in  $\mathbb{R}^3$ ? Why or why not?
- iii) Do the columns of  $A$  span  $\mathbb{R}^3$ ? Why or why not?
- iv) Find the general equation of the plane spanned by the first two columns of  $A$ .

(Hint: Let  $\mathbf{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  is in the span of first two columns of  $A$ . Write  $\mathbf{u}$  as the linear combination of first two columns of  $A$  and then form an equation in terms of  $x$ ,  $y$  and  $z$ .)

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Let  $A = \begin{bmatrix} 1 & 3 & -4 \\ 1 & 5 & 2 \\ -3 & -7 & 6 \end{bmatrix}$  and  $\mathbf{b} = \begin{bmatrix} -2 \\ 4 \\ 12 \end{bmatrix}$ .

- i) Is  $\mathbf{b}$  in the subset of  $\mathbb{R}^3$  spanned by the columns of  $A$ ?
- ii) Does the equation  $A\mathbf{x} = \mathbf{y}$  have a solution for each  $\mathbf{y}$  in  $\mathbb{R}^3$ ? Why or why not?
- iii) Do the columns of  $A$  span  $\mathbb{R}^3$ ? Why or why not?
- iv) Find the general equation of the plane spanned by the first two columns of  $A$ .

(Hint: Let  $\mathbf{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$  is in the span of first two columns of  $A$ . Write  $\mathbf{u}$  as the linear combination of first two columns of  $A$  and then form an equation in terms of  $x$ ,  $y$  and  $z$ .)