

EE2211 Tutorial 4

(Systems of Linear Equations)

Question 1:

Given $\mathbf{X}\mathbf{w} = \mathbf{y}$ where $\mathbf{X} = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

(Systems of Linear Equations)

Question 2:

Given $\mathbf{X}\mathbf{w} = \mathbf{y}$ where $\mathbf{X} = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

(Systems of Linear Equations)

Question 3:

Given $\mathbf{X}\mathbf{w} = \mathbf{y}$ where $\mathbf{X} = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 1 & -1 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} 0 \\ 0.1 \\ 1 \end{bmatrix}$.

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

(Systems of Linear Equations)

Question 4:

Given $\mathbf{X}\mathbf{w} = \mathbf{y}$ where $\mathbf{X} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 1 & -1 & 1 & -1 \\ 1 & 1 & 0 & 0 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$.

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

(Systems of Linear Equations)

Question 5:

Given $\mathbf{w}^T \mathbf{X} = \mathbf{y}^T$ where $\mathbf{X} = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix}$, $\mathbf{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$.

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

(Systems of Linear Equations)

Question 6:

Given $\mathbf{w}^T \mathbf{X} = \mathbf{y}^T$ where

$$\mathbf{X} = \begin{bmatrix} 1 & 2 \\ 2 & 4 \\ 1 & -1 \end{bmatrix}, \mathbf{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}.$$

- (a) What kind of system is this? (even-, over- or under-determined?)
- (b) Is \mathbf{X} invertible? Why?
- (c) Solve for \mathbf{w} if it is solvable.

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Question 7:

This question is related to determination of types of system where an appropriate solution can be found subsequently. The following matrix has a left inverse.

$$\mathbf{X} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- a) True
- b) False

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Question 8:

MCQ: Which of the following is/are true about matrix \mathbf{A} below? **There could be more than one answer.**

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

- a) \mathbf{A} is invertible
- b) \mathbf{A} is left invertible
- c) \mathbf{A} is right invertible
- d) \mathbf{A} has no determinant
- e) None of the above