

In Class Quiz 3

Question 1

Assume the matrix

$$K = \begin{bmatrix} \mathbf{0} & \mathbf{B} \\ \mathbf{A} & \mathbf{I} \end{bmatrix}$$

makes sense, where $\mathbf{0}$ is 3x4 zero matrix and \mathbf{I} is 2x2 identity matrix.

What are the sizes of \mathbf{A} , \mathbf{B} and \mathbf{K} ? Briefly Explain ?

(5 marks)

Question 2

Suppose that \mathbf{S} is a $n \times D$ transaction matrix of a supermarket company, that gives the sale amount (in HKD) of n products over D days. What are the meanings of $\mathbf{S}\mathbf{1}$ and $\mathbf{S}^T\mathbf{1}$? Your answer should be in English.

(5 marks)

Question 3

Given

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

- (a) Compute $\mathbf{B} = \mathbf{A}^T\mathbf{A}$ and $\mathbf{C} = \mathbf{A}\mathbf{A}^T$.
- (b) Compute determinants of \mathbf{B} and \mathbf{C} .
- (c) **What is the inverse of \mathbf{B} ?**
- (d) Given $\mathbf{A}^T\mathbf{A}\mathbf{x} = \mathbf{A}^T\mathbf{b}$, where $\mathbf{b} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, what is \mathbf{x} ?
- (e) Does \mathbf{C}^3 have inverse? Explain.

(10 marks)