867002105_HW0

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1 Minimum Background Test

1.1 Linear Algebra

Consider the matrix X and the vectors y and z below:

$$X = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix} \quad y = \begin{bmatrix} 3 \\ 5 \end{bmatrix} \quad z = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$$

Problem 1

What is the inner product $< y, z >$ of the vectors y and z? (this is also called the dot product and written $y^T z$)

$$y^T z = \begin{bmatrix} 3 & 5 \end{bmatrix} \begin{bmatrix} 6 \\ 1 \end{bmatrix} = (3)(6) + (5)(1) = 18 + 5 = 23$$

Problem 2

What is the matrix-vector product Xy?

Problem 3

Is X invertible? If so, give the inverse and if no, explain why not.

Problem 4

What is the Rank of X?

1.2 Calculus

Problem 1

Problem 2

1.3 Probability and Statistics

Problem 1

Problem 2

Problem 3

Problem 4

Problem 5

1.4 Big-O Notation

Problem 1

Problem 2

Problem 3

2 Medium Background Test

2.1 Probability and Statistics

Problem 1

Problem 2

Problem 3