

Step-by-Step Solutions for Matrix Problems

Problem (b)

Given:

$$A = [[0, 1], [2, 3]]$$

$$B = [[1, 3], [4, 0]]$$

Find X such that: $(A^{-1} + B^T)X = (AB)^T$

Step 1: Compute A^{-1}

$$\det(A) = (0)(3) - (2)(1) = -2$$

$$A^{-1} = (1/-2) * [[3, -1], [-2, 0]] = [[-1.5, 0.5], [1, 0]]$$

Step 2: Compute B^T

$$B^T = [[1, 4], [3, 0]]$$

Step 3: Compute $A^{-1} + B^T$

$$A^{-1} + B^T = [[-1.5+1, 0.5+4], [1+3, 0+0]] = [[-0.5, 4.5], [4, 0]]$$

Step 4: Compute AB

$$AB = [[0*1+1*4, 0*3+1*0], [2*1+3*4, 2*3+3*0]] = [[4, 0], [14, 6]]$$

$$(AB)^T = [[4, 14], [0, 6]]$$

Step 5: Solve for X

Let $M = [[-0.5, 4.5], [4, 0]]$ and $Y = [[4, 14], [0, 6]]$

Compute M^{-1} :

$$\det(M) = (-0.5)(0) - (4)(4.5) = -18$$

$$M^{-1} = (1/-18) * [[0, -4.5], [-4, -0.5]] = [[0, 0.25], [0.2222, 0.0278]]$$

$$X = M^{-1} * Y = [[0, 0.25], [0.2222, 0.0278]] * [[4, 14], [0, 6]]$$

$$X = [[0, 1.5], [0.8889, 3.2778]]$$

Final Answer for (b):

$$X = [[0, 1.5], [0.8889, 3.2778]]$$

Problem (c)

$$\text{Matrix } A = [[1, 2, 0], [3, -1, 2], [-2, 3, -2]]$$

Compute determinant:

$$\begin{aligned}\det(A) &= 1*((-1)*(-2) - (2)*(3)) - 2*((3)*(-2) - (2)*(-2)) + 0*((3)*(3) - (-1)*(-2)) \\ &= 1*(2 - 6) - 2*(-6 - (-4)) + 0*(9 - 2) \\ &= -4 - 2*(-2) + 0 \\ &= -4 + 4 = 0\end{aligned}$$

Since determinant = 0, matrix A is singular.