Linear Algebra Cheat Sheet
Inverse Matrix

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January 2024

1 Properties of Inverse Matrix

- $AA^{-1} = I$, $A^{-1}A = I$
- $(A^T)^{-1} = (A^{-1})^T$
- $(AB)^{-1} = B^{-1}A^{-1}$

Question 1 If A and M have inverse and

- $AX = B$
- $YM = C$
- $AZM = D$

what is X, Y, Z?

2 Elimination

Elimination as Matrix Operation We can write the operations to change equivalent linear system by $[A|b] \to [E_{ij}A|E_{ij}b]$ and $[P_{ij}A|P_{ij}b]$.

- Elimination matrix E_{ij}:
  - Replace row (i) by $*$*row(i) + row (j)
  - Identity matrix except $a_{ij} = *$
- Permutation matrix P_{ij}:
  - Swtich Row (i) with Row (j)
  - Identity matrix except $a_{ij} = a_{ji} = 1, a_{ii} = a_{jj} = 0$

Question 2 What is the matrix after the following operations

- Change Row 2 of A to Row 2 + 2* Row 1
- Switch Row 3 and Row 4
- Change Row 4 of A to Row 4 + 2* Row 2