

# Week-1

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1.5

8.

$$C_{ij} = (AB)_{ij} - (BA)_{ij} \quad (1)$$

$$= \sum_r (A_{ir}B_{rj} - B_{ir}A_{rj}) \quad (2)$$

$$\sum_i C_{ii} = \sum_i \sum_r (A_{ir}B_{ri} - B_{ir}A_{ri}) \quad (3)$$

$$= \sum_{(i,r), i \leq r} (A_{ir}B_{ri} - B_{ri}A_{ir}) = 0 \quad (4)$$

1.6

9.

Assume  $A_{kk} = 0$  and  $A_{ii} \neq 0, i \neq k$ , then, we can reduce A to the form below.

$$A'_{ij} = \delta_{ij}, j \neq k \quad (5)$$

In this form, the linear combination of rows can't be the k-th row of identity matrix.

11.

Trivial problem. We can first do row operation to make  $PA$  be a row-reduced echelon, and then do column operations to make  $PAQ$  be column-reduced echelon matrix.