1. (15 points) Give definition of trace and write properties of trace operation

2. (15 points) Give definition of conjugate transpose and properties of operations of conjugate transpose.

$$a_{ij} = \begin{cases} 1 & \text{if grave } i \text{ contains pottery type } j \\ 0 & \text{if grave } i \text{ does not contain pottery type } j \end{cases}$$

3. (20 points)

Let g_{ij} denote the element at the cross entry of the ith row and the jth column of AA^t. State the meaning of g_{ij} and explain why.

4 (30 points) When A^{-1} exist, explain

$$\begin{bmatrix} A: I_n \end{bmatrix} \approx L \approx \begin{bmatrix} I_n: B \end{bmatrix} \text{ where } B = A^{-1}.$$

5. Write the properties of matrix inverse