

Quiz 4 For DLS 210

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Problem 1 For matrix  $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 4 \\ 4 & 6 & 8 & 10 \end{bmatrix}$

Find basis of  $\text{col}(A)$  and basis of  $\text{nul}(A)$

Problem 2: calculate the determinant

$$\begin{vmatrix} 1 & 0 & 3 & 1 \\ 2 & 2 & 1 & 1 \\ 3 & 5 & 0 & 0 \\ 4 & 2 & 0 & 2 \end{vmatrix}$$

Problem 3:

1) For vectors  $\underline{u}_1, \underline{u}_2, \underline{u}_3 \in \mathbb{R}^3$  being linearly independent

show that  $\underline{u}_1, \underline{u}_2 - \underline{u}_1, \underline{u}_3 - \underline{u}_2$  is also linearly independent.

(2) We know that  $\text{rank } A = \text{rank } A^T$

Combine this together with rank theorem to show that for  $m \times n$  matrix  $A$

$$\dim(\text{nul } A) - \dim(\text{nul } A^T) = n - m.$$