Introduction to Linear Algebra

Review quiz

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Problem 1. The matrix $\begin{bmatrix} 9 & -2 \\ 1 & 6 \\ 5 & 7 \end{bmatrix}$ has m rows and n columns. Find the value of m^n.

Problem 2. It is given that $A = \begin{bmatrix} 3 & 2 \\ 0 & -1 \\ 1 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$ and $AB = C$. Determine the order of matrix C.

Problem 3. It is given that matrix $D = \begin{bmatrix} 4 & p \\ -2 & 3 \end{bmatrix}$. Calculate the value of p if the determinant of D is 0.

Problem 4. Let $E = \begin{bmatrix} 2 & 8 \\ 1 & 5 \end{bmatrix} + \begin{bmatrix} 14 & 6 \\ 2 & 15 \end{bmatrix}$. Find the greatest common divisor of the elements of E.

Problem 5. Suppose

$$A = \begin{bmatrix} 1 & 1 & \cdots & 1 \\ 1 & a\langle 2,2 \rangle & \cdots & a\langle 2,2022 \rangle \\ \vdots & \vdots & \ddots & \vdots \\ 1 & a\langle 2022,2 \rangle & \cdots & a\langle 2022,2022 \rangle \end{bmatrix}$$

and $a\langle m,n \rangle = a\langle m-1,n \rangle + a\langle m,n-1 \rangle$, for $2 \leq m \leq 2022, 2 \leq n \leq 2022$ and $m,n \in \mathbb{Z}^+$. Find the sum of digits of $a\langle 2021,3 \rangle$.

(Note: $a\langle m,n \rangle$ denotes the element of A in the m-th row and n-th column.)