Maths Assignment

MCQ'S

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Shorts Question

Semi groups:-

A Semi-group is an alegbraic structure consisting of a set together with an associative binary operation

(ii)

Prepare a table of multiplication of the elements of the set of residue classess modulo 5.

×	[0]	[1]	[2]	[3]	[4]
[0]	[0]	[0]	[0]	[0]	[0]
[1]	[0]	[1]	[2]	[3]	[4]
[2]	[0]	[2]	[4]	[1]	[3]
[3]	[0]	[3]	[1]	[4]	[2]
[4]	[0]	[4]	[3]	[2]	[1]

Q3 If $A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$, show that $A^4 = I_2$

$$A^2 = A \cdot A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix} \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$$

$$= \begin{bmatrix} (i)(i) + (0)(1) & (i)(0) + (0)(-i) \\ (1)(i) + (-i)(1) & (1)(0) + (-i)(-i) \end{bmatrix}$$

$$= \begin{bmatrix} i^2 + 0 & 0 + 0 \\ i - i & 0 + i^2 \end{bmatrix}$$

$$= \begin{bmatrix} i^2 & 0 \\ 0 & i^2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$A^4 = A^2 \cdot A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$$

$$= \begin{bmatrix} (-1)(-1)+(0)(0) & (-1)(0)+(0)(-1) \\ (0)(-1)+(-1)(0) & (0)(0)+(-1)(-1) \end{bmatrix}$$

$$= \begin{bmatrix} 1+0 & 0+0 \\ 0+0 & 0+1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I_2.$$

Long Question

Prove that all 2X2 non singular matrices over the real field form a non abelian group under multiplication.