

Mathematics

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August 21, 2016

1 ORAL 2016

Let I_3 be the identity matrix and $J_3 = ((1))_{1 \leq i, j \leq 3}$ and the matrix M ;

$$M = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

1. Compute M^2 , and express it using I_3 and J_3 .
2. Express J_3^2 using J_3 .
3. Express M^4 using I_3 and J_3 .
4. Derive a non-zero polynomial P such that $P(M) = 0$.
5. Find the roots of the polynomial P .
6. Find the eigenvalues of M .