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Computer Science

MAT

1) In linear algebra, the Cayley-Hamilton theorem states that every square matrix over a commutative ring satisfies its own characteristic equation.

$$2) A = \begin{pmatrix} 2 & 27 & 0 \\ 0 & 4 & 40 \\ 0 & 3 & 30 \end{pmatrix}$$

$$\Delta t = t^3 - \text{tr}(A)t^2 + (A_{11} + A_{22} + A_{33})t - \det(A)$$

$$\Rightarrow \text{tr}(A) = 2 + 4 + 30 = 36$$

$$\therefore A_{11} = (-1)^2 \begin{vmatrix} 4 & 40 \\ 3 & 30 \end{vmatrix} \\ = (120 - 120) = 0$$

$$A_{22} = (-1)^4 \begin{vmatrix} 2 & 0 \\ 0 & 30 \end{vmatrix} \\ = (60 - 0) = 60$$

$$A_{33} = (-1)^6 \begin{vmatrix} 2 & 27 \\ 0 & 4 \end{vmatrix} \\ = (6 - 0) = 6$$

$$\therefore \det(A) = 2 \begin{vmatrix} 4 & 40 \\ 3 & 30 \end{vmatrix} - 27 \begin{vmatrix} 0 & 40 \\ 0 & 30 \end{vmatrix} + 0 \begin{vmatrix} 0 & 4 \\ 0 & 3 \end{vmatrix} \\ = 2(120 - 120) - 27(0) + 0(0) \\ = 0$$

$$\Delta t = t^3 - 36t^2 + (0 + 60 + 6)t - 0 \\ = t^3 - 36t^2 + 66t$$