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Ques 2 A)

soln)

$$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 1 & -2 & 1 \end{bmatrix}$$

The characteristic eqn is

$|A - \lambda I| = 0$

$$\begin{bmatrix} 1-\lambda & 2 & -2 \\ -1 & 3-\lambda & 0 \\ 1 & -2 & 1-\lambda \end{bmatrix} = 0$$

$= (1-\lambda)[\cancel{0} (3-\lambda)(1-\lambda)] - 2[-1(1-\lambda)] - 2[2-(3-\lambda)]$

$= (1-\lambda)[3 - 3\lambda - \lambda + \lambda^2] - 2[-1+\lambda] - 2[-1+\lambda]$

$= (1-\lambda)[\lambda^2 - 4\lambda + 3] - 2[\lambda - 1] - 2[\lambda - 1]$

$= \lambda^2 - 4\lambda + 3 - \lambda^3 + 4\lambda^3 - 3\lambda - 2\lambda + 2 - 2\lambda + 2 = 0$

$= -\lambda^3 + 5\lambda^2 - 11\lambda + 7 = 0$

$= \lambda^3 - 5\lambda^2 + 11\lambda - 7 = 0$

Cayley - Hamilton theorem states that this equation satisfy by A

i.e. $A^3 - 5A^2 + 11A - 7 = 0$

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Comp. A

Now multiplying by A^{-1}

$$= A^3(A^{-1}) - 5A^2(A^{-1}) + 11A(A^{-1}) - 7IA^{-1} = 0$$

$$= A^2 - 5A + 11I - 7A^{-1} = 0$$

$$\boxed{A^2 - 5A + 11I = 7A^{-1}}$$