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(A) $\lambda_1 = 1 \quad \lambda_2 = -1 \quad \lambda_3 = 2$ $\quad V_1 = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$ $\quad V_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

$A = S.D.S^{-1}$ $\quad V_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ -1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -1 & 1 \end{bmatrix}}_{\text{Inverse of S}}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & -1 & 0 \\ -1 & -1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & -1 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 2 & -1 & 0 \\ 4 & -3 & 2 \end{bmatrix}$$

(B) lower triangular matrix:

$$\det\left(\begin{bmatrix} 1 & 0 & 0 \\ 2 & -1 & 0 \\ 4 & -3 & 2 \end{bmatrix}\right) = 1.-1.2 = -2$$

(C)

$\det(A).\det(A).\det(B) = -8$