

If A is an $m \times n$ matrix, then $A^T A$ is an $m \times m$ matrix

- (a) True, and I can explain why
- (b) True, but I am unsure why
- (c) False, and I can explain why
- (d) False, but I am unsure why
- (e) Hmmmmm. . .

If A is an $m \times n$ matrix, then $A^T A$ is an $n \times n$ symmetric matrix

- (a) True, and I can explain why
- (b) True, but I am unsure why
- (c) False, and I can explain why
- (d) False, but I am unsure why
- (e) Hmmmmm. . .

If $\vec{u} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $\vec{v} = \begin{bmatrix} -2 \\ 3 \\ 1 \end{bmatrix}$ then $\vec{u}^T \vec{v} =$

(a) $\begin{bmatrix} -2 & 3 & 1 \\ -4 & 6 & 2 \\ -6 & 9 & 3 \end{bmatrix}$

(b) 7

(c) $\begin{bmatrix} -2 & -4 & -6 \\ 3 & 6 & 9 \\ 1 & 2 & 3 \end{bmatrix}$

(d) Is undefined

(e) None of the above

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(c) $\begin{bmatrix} -2 & -4 & -6 \\ 3 & 6 & 9 \\ 1 & 2 & 3 \end{bmatrix}$

(d) Is undefined

(e) None of the above

If $P = \begin{bmatrix} 1 & 4 \\ 2 & 5 \end{bmatrix}$ and $D = \begin{bmatrix} -2 & 0 \\ 0 & 3 \end{bmatrix}$ then $DP =$

(a) $\begin{bmatrix} -2 & 12 \\ -4 & 15 \end{bmatrix}$

(c) $\begin{bmatrix} -2 & -8 \\ 6 & 15 \end{bmatrix}$

(b) $\begin{bmatrix} -10 \\ 21 \end{bmatrix}$

(d) Is undefined

(e) None of the above

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(a) $\begin{bmatrix} -2 & 12 \\ -4 & 15 \end{bmatrix}$

(c) $\begin{bmatrix} -2 & -8 \\ 6 & 15 \end{bmatrix}$

(b) $\begin{bmatrix} -10 \\ 21 \end{bmatrix}$

(d) Is undefined

(e) None of the above

$$\text{Let } A = \begin{bmatrix} -2 & 0 & 0 \\ 0 & 1 & -4 \\ 0 & -4 & 1 \end{bmatrix}$$

1. Find an orthogonal diagonalization $A = PDP^T$
2. Write $P = [\vec{u}_1 \quad \vec{u}_2 \quad \vec{u}_3]$ and let $\lambda_1, \lambda_2, \lambda_3$ be the entries on the diagonal of D
 - (a) Compute $\lambda_1 \vec{u}_1 \vec{u}_1^T$, $\lambda_2 \vec{u}_2 \vec{u}_2^T$, and $\lambda_3 \vec{u}_3 \vec{u}_3^T$
 - (b) Sum the three matrices from part (a)