

Matrix Algebra Exercises

Let:

$$\mathbf{A} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \quad \mathbf{C} = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix} \quad \mathbf{D} = \begin{bmatrix} 1 & 3 \\ 2 & .5 \\ 3 & 6 \end{bmatrix}$$
$$\mathbf{E} = \begin{bmatrix} 1 & .2 \\ .2 & 1 \end{bmatrix} \quad \mathbf{F} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \boldsymbol{\mu} = \begin{bmatrix} 0 & 0 \end{bmatrix}$$
$$\mathbf{x} = \begin{bmatrix} .3 & -.2 \end{bmatrix} \quad \pi = [\mathbf{3.14159}]$$

Find:

1. \mathbf{AA}'
2. $\mathbf{A}'\mathbf{A}$
3. $\mathbf{A} + \mathbf{B}$
4. $\mathbf{A} + \mathbf{B}'$ ¹
5. $\mathbf{A} + 2\mathbf{B}$
6. $\det(\mathbf{E})$
7. $2\pi\sqrt{\det(\mathbf{E})}$
8. $-.5((\mathbf{x} - \boldsymbol{\mu})' \boldsymbol{\Sigma}(\mathbf{x} - \boldsymbol{\mu}))$
9. $\frac{\exp[-.5((\mathbf{x} - \boldsymbol{\mu})' \boldsymbol{\Sigma}(\mathbf{x} - \boldsymbol{\mu}))]}{2\pi\sqrt{\det(\mathbf{E})}}$
10. $-2\ln \left[\frac{\exp[-.5((\mathbf{x} - \boldsymbol{\mu})' \boldsymbol{\Sigma}(\mathbf{x} - \boldsymbol{\mu}))]}{2\pi\sqrt{\det(\mathbf{E})}} \right]$

¹This may be a trick question!