1.4 Solutions

#4 $A = \text{diag}(-1, -2, 1)$

$$A^{-1} = \text{diag}\left(-1, -\tfrac{1}{2}, 1\right)$$

$$(A^{-1})^4 = \text{diag}\left((-1)^4, (-\tfrac{1}{2})^4, 1^4\right)$$

$$= \text{diag}\left(1, \tfrac{1}{16}, 1\right)$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1/16 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

#12

$$\begin{bmatrix} -2 & 1 \\ 3 & 5 \\ -4 & 1 \end{bmatrix}^T \begin{bmatrix} 1 & 2 & -3 \\ 1 & -2 & 1 \end{bmatrix}^T$$

$$= \begin{bmatrix} -2 & 3 & -4 \\ 1 & 5 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 2 & -2 \\ -3 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} -2+6+12 & -2-6-4 \\ 1+10-3 & 1-10+1 \end{bmatrix}$$

$$= \begin{bmatrix} 16 & -12 \\ 8 & -8 \end{bmatrix}$$

~~#16~~

$$A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 0 & 4 \\ 3 & 4 & 5 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & 0 & -1 \\ 1 & 4 & 2 \\ -1 & 2 & 1 \end{bmatrix}$$

Symmetric not symmetric

#16 B is not symmetric

#18 A^{-1} is symmetric since A is (theorem 1.14)

#20 B^TB is always symmetric

~~#~~ $(B^TB)^T = B^T(B^T)^T$

$= B^T(B) = B^TB$.

(theorem 1.14)