

$$1.1 \quad \vec{a} = \begin{pmatrix} 1 \\ 6 \\ 3 \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} 5 \\ 2 \\ 4 \end{pmatrix}$$

$$1.1.1) \quad \vec{a} + \vec{b} = \begin{pmatrix} 6 \\ 8 \\ 7 \end{pmatrix} \quad \checkmark$$

$$1.1.2) \quad \vec{a} - \vec{b} = \begin{pmatrix} -4 \\ 4 \\ -1 \end{pmatrix} \quad \checkmark$$

$$1.1.3) \quad 7\vec{a} = \begin{pmatrix} 7 \\ 42 \\ 21 \end{pmatrix} \quad \checkmark$$

$$1.1.4) \quad 2(\vec{a} + \vec{b}) = \begin{pmatrix} 48 \\ 64 \\ 56 \end{pmatrix} \quad \checkmark$$

$$1.2 \quad A = \begin{pmatrix} 2 & 1 \\ 5 & 3 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 4 \\ 1 & 5 \end{pmatrix}$$

$$1.2.1 \quad A + B = \begin{pmatrix} 3 & 5 \\ 6 & 8 \end{pmatrix} \quad \checkmark$$

$$1.2.2 \quad A - 3B = \begin{pmatrix} -1 & -11 \\ 2 & -12 \end{pmatrix} \quad \checkmark$$

$$2.1) \quad \vec{v} = \begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix} \quad A = \begin{pmatrix} 1 & 3 & 4 \\ 5 & 9 & 0 \\ 3 & 1 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 5 \end{pmatrix}$$

$$2.1.1) \quad A\vec{v} = \begin{pmatrix} 1 & 3 & 4 \\ 5 & 9 & 0 \\ 3 & 1 & 2 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix} \\ = \begin{pmatrix} 13 \\ 5 \\ 9 \end{pmatrix} \quad \checkmark$$

$$2.1.2) \quad B\vec{v} = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 5 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix} \\ = \begin{pmatrix} 10 \\ 15 \end{pmatrix} \quad \checkmark$$

$$2.1.3) \quad BA = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 5 \end{pmatrix} \begin{pmatrix} 1 & 3 & 4 \\ 5 & 9 & 0 \\ 3 & 1 & 2 \end{pmatrix} \\ = \begin{pmatrix} 10 & 6 & 10 \\ 25 & 23 & 10 \end{pmatrix} \quad \checkmark$$

$$2.1.4) \quad B^T = \begin{pmatrix} 1 & 0 \\ 0 & 2 \\ 3 & 5 \end{pmatrix} \quad \checkmark$$

$$2.2) \quad A = \begin{pmatrix} 2 & 1 \\ 4 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix}$$

3/4

$$2.2.1) \quad AB = \begin{pmatrix} 5 & 7 \\ 7 & 13 \end{pmatrix} \quad \checkmark$$

$$2.2.2) \quad A^{-1} \quad \left(\begin{array}{cc|cc} 2 & 1 & 1 & 0 \\ 4 & 1 & 0 & 1 \end{array} \right)$$

$$= \left(\begin{array}{cc|cc} 0 & 1 & 2 & -1 \\ 4 & 1 & 0 & 1 \end{array} \right)$$

$$= \left(\begin{array}{cc|cc} 0 & 1 & 2 & -1 \\ 4 & 0 & -2 & 2 \end{array} \right)$$

$$= \left(\begin{array}{cc|cc} 0 & 1 & 2 & -1 \\ 1 & 0 & -0.5 & 0.5 \end{array} \right)$$

$$= \left(\begin{array}{cc|cc} 1 & 0 & -0.5 & 0.5 \\ 0 & 1 & 2 & -1 \end{array} \right)$$

$$A^{-1} = \frac{1}{\det(A)} \begin{pmatrix} 1 & -1 \\ -4 & 2 \end{pmatrix}$$

$$= \frac{1}{-2} \begin{pmatrix} 1 & -1 \\ -4 & 2 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} -0.5 & 0.5 \\ 2 & -1 \end{pmatrix}} \quad \checkmark$$

2.2)

$$A = \begin{pmatrix} 2 & 1 \\ 4 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix}$$

4/4

2.2.3)

$$B^{-1} = \frac{1}{\det(B)} \begin{pmatrix} 1 & -3 \\ -3 & 1 \end{pmatrix}$$

$$= \frac{1}{-8} \begin{pmatrix} 1 & -3 \\ -3 & 1 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} -1/8 & 3/8 \\ 3/8 & -1/8 \end{pmatrix}} \quad \checkmark$$

2.2.4)

$$BAB^{-1} = (BA)B^{-1}$$

$$= \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 4 & 1 \end{pmatrix} B^{-1}$$

$$= \begin{pmatrix} 14 & 4 \\ 10 & 4 \end{pmatrix} B^{-1}$$

$$= \begin{pmatrix} 14 & 4 \\ 10 & 4 \end{pmatrix} \begin{pmatrix} -1/8 & 3/8 \\ 3/8 & -1/8 \end{pmatrix}$$

$$= \begin{pmatrix} -2/8 & 38/8 \\ 2/8 & 26/8 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} -1/4 & 19/4 \\ 1/4 & 13/4 \end{pmatrix}} \quad \checkmark$$