

Vectors and Matrices

1. Complete the following vector operations.

a) $(1, 2)^T$. **Answer.** $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ (transpose).

b) $\begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} 3 \\ 4 \end{pmatrix}$. **Answer.** $\begin{pmatrix} a + 3 \\ b + 4 \end{pmatrix}$.

c) $c \begin{pmatrix} 5 \\ 6 \end{pmatrix}$. **Answer.** $\begin{pmatrix} 5c \\ 6c \end{pmatrix}$.

2. Compute the following matrix products:

a) $(a, b) \begin{pmatrix} 1 \\ 2 \end{pmatrix}$. **Answer.** $a + 2b$ (1×2 times $2 \times 1 = 1 \times 1$.)

b) $\begin{pmatrix} a \\ b \end{pmatrix} (1, 2)$. **Answer.** $\begin{pmatrix} a & 2a \\ b & 2b \end{pmatrix}$ (2×1 times $1 \times 2 = 2 \times 2$.)

c) $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix}$. **Answer.** $\begin{pmatrix} a + 2b \\ c + 2d \end{pmatrix}$.

d) $(1, 2) \begin{pmatrix} a & b \\ c & d \end{pmatrix}$. **Answer.** $(a + 2c, b + 2d)$.

e) $\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. **Answer.** $\begin{pmatrix} a + 3b & 2a + 4b \\ c + 3d & 2c + 4d \end{pmatrix}$.

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