These exercises are from *Fundamental Methods of Mathematical Economics*, 4th edition, by A. C. Chiang and K. Wainwright.

4.2.1.

Given $A = \begin{bmatrix} 7 & -1 \\ 6 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 4 \\ 3 & -2 \end{bmatrix}$, and $C = \begin{bmatrix} 8 & 3 \\ 6 & 1 \end{bmatrix}$, find:

a. $A + B$

b. $C - A$

c. $3A$

d. $4B + 2C$

4.2.2.

Given $A = \begin{bmatrix} 2 & 8 \\ 3 & 0 \\ 5 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 \\ 3 & 8 \end{bmatrix}$, and $C = \begin{bmatrix} 7 & 2 \\ 6 & 3 \end{bmatrix}$:

a. Is AB defined? Calculate AB. Can you calculate BA? Why?

b. Is BC defined? Calculate BC. Is CB defined? If so, calculate CB. Is it true that $BC = CB$?

4.2.4.

Find the product matrices in the following.

a. $\begin{bmatrix} 0 & 2 & 0 \\ 3 & 0 & 4 \\ 2 & 3 & 0 \end{bmatrix} \begin{bmatrix} 8 & 0 \\ 0 & 1 \\ 3 & 5 \end{bmatrix}$

b. $\begin{bmatrix} 6 & 5 & -1 \\ 1 & 0 & 4 \end{bmatrix} \begin{bmatrix} 4 & -1 \\ 5 & 2 \\ 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 3 & 5 & 0 \\ 4 & 2 & -7 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

d. $\begin{bmatrix} a & b & c \end{bmatrix} \begin{bmatrix} 7 & 0 \\ 0 & 2 \\ 1 & 4 \end{bmatrix}$

4.3.1.

Given $u^T = \begin{bmatrix} 5 & 1 & 3 \end{bmatrix}$, $v^T = \begin{bmatrix} 3 & 1 & -1 \end{bmatrix}$, $w^T = \begin{bmatrix} 7 & 5 & 8 \end{bmatrix}$, and $x^T = \begin{bmatrix} x_1 & x_2 & x_3 \end{bmatrix}$, find:

a. uv^T

c. xx^T

d. $v^T u$

4.4.1.

Given $A = \begin{bmatrix} 3 & 6 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 7 \\ 8 & 4 \end{bmatrix}$, $C = \begin{bmatrix} 3 & 4 \\ 1 & 9 \end{bmatrix}$, verify that

a. $(A + B) + C = A + (B + C)$

4.4.3.

Test the associative law of multiplication with the following matrices:

$$A = \begin{bmatrix} 5 & 3 \\ 0 & 5 \end{bmatrix} \quad B = \begin{bmatrix} -8 & 0 & 7 \\ 1 & 3 & 2 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 \\ 0 & 3 \\ 7 & 1 \end{bmatrix}$$

4.4.5.

Find $C = AB$.

a. $A = \begin{bmatrix} 12 & 14 \\ 20 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 9 \\ 0 & 32 \end{bmatrix}$

4.5.1.

Given $A = \begin{bmatrix} -1 & 5 & 7 \\ 0 & -2 & 4 \end{bmatrix}$, $b = \begin{bmatrix} 9 \\ 6 \\ 0 \end{bmatrix}$, and $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$:

Calculate

1. AI
2. IA
3. Ix
4. $x^T I$

Indicate the dimension of the identity matrix used in each case.

4.5.2.

Using the matrices given in 4.5.1, calculate

a. Ab

b. AIb

c. $x^T IA$

d. $x^T A$

Does the insertion of I in part b affect the result in part a? Does the insertion of I in part d affect the result in part c?

4.5.3.

Using the matrices given in 4.5.1, what is the dimension of the null matrix resulting from each of the following?

a. Premultiply A by a 5×2 null matrix.

b. Postmultiply A by a 3×6 null matrix.

4.6.1.

Given $A = \begin{bmatrix} 0 & 4 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -8 \\ 0 & 1 \end{bmatrix}$, and $C = \begin{bmatrix} 1 & 0 & 9 \\ 6 & 1 & 1 \end{bmatrix}$, find A^T, B^T, C^T.

4.6.2.

Use the matrices given in 4.6.1 to verify that

a. $(A + B)^T = A^T + B^T$

b. $(AC)^T = C^T A^T$