1.(a)

$$-3/2 \begin{pmatrix} 8 & -6 \\ 10 & -3 \end{pmatrix} = \begin{pmatrix} -12 & 9 \\ -15 & 4.5 \end{pmatrix}$$

1.(b)

$$4 \begin{pmatrix} -2 & 1 & 0 & 5 \end{pmatrix} = \begin{pmatrix} -8 & 4 & 0 & 20 \end{pmatrix}$$

1.(c)

$$-1 \begin{pmatrix} 1 \\ 2 \\ 0 \\ \pi \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 0 \\ \pi \end{pmatrix}$$

1.(d)

$$0 \begin{pmatrix} -2 & 3 & \pi \\ e & 4 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

2.(a)

$$\begin{pmatrix} -2 & 4 \end{pmatrix} \begin{pmatrix} -5 \\ -6 \end{pmatrix}$$

$\begin{pmatrix} -2 & 4 \end{pmatrix}$ is a 1 row by 2 columns matrix.

$\begin{pmatrix} -5 \\ -6 \end{pmatrix}$ is a 2 rows by 1 column matrix.

So, They can multiply. The result will be 1 row by 1 column matrix.

$$\begin{pmatrix} -2 & 4 \end{pmatrix} \begin{pmatrix} -5 \\ -6 \end{pmatrix} = \begin{pmatrix} 14 \end{pmatrix}$$

2.(b)

$$\begin{pmatrix} 0 & 1 \\ \pi & 0 \end{pmatrix} \begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \\ 3 & 4 & -1 \end{pmatrix}$$

$\begin{pmatrix} 0 & 1 \\ \pi & 0 \end{pmatrix}$ is a 2 rows by 2 columns matrix.

$\begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \\ 3 & 4 & -1 \end{pmatrix}$ is a 3 rows by 3 columns matrix.

Since, the number of column of the first matrix is not equal to the number of rows of the first matrix, the two matrices cannot multiply.

2.(c)

$$\begin{pmatrix} 0 & 1 \\ \pi & 0 \end{pmatrix} \begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \end{pmatrix}$$

$\begin{pmatrix} 0 & 1 \\ \pi & 0 \end{pmatrix}$ is a 2 rows by 2 columns matrix.

$\begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \end{pmatrix}$ is a 2 rows by 3 columns matrix.

So, They can multiply. The result will be 2 rows by 3 column matrix.

$$\begin{pmatrix} 0 & 1 \\ \pi & 0 \end{pmatrix} \begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 1.414 & 5 & 1 \\ 9.872 & 0 & 8.54 \end{pmatrix}$$

2.(d) $\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix} \begin{pmatrix} -2 \\ 4 \\ e \end{pmatrix}$

$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix}$ is a 2 rows by 3 columns matrix.

$\begin{pmatrix} -2 \\ 4 \\ e \end{pmatrix}$ is a 3 rows by 1 columns matrix.

So, They can multiply. The result will be 2 rows by 1 column matrix.

$$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix} \begin{pmatrix} -2 \\ 4 \\ e \end{pmatrix}$$

$$= \begin{pmatrix} 9.436 \\ 7.306 \end{pmatrix}$$

2.(e) $\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix} \begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \end{pmatrix}$

$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix}$ is a 2 rows by 3 columns matrix.

$\begin{pmatrix} \pi & 0 & e \\ \sqrt{2} & 5 & 1 \end{pmatrix}$ is a 2 rows by 3 columns matrix.

Since, the number of column of the first matrix is not equal to the number of rows of the first matrix, the two matrices cannot multiply.

2.(f)

$$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix} \begin{pmatrix} -2 & 0 & -1 & 2/3 \\ 4 & 0 & 3 & 2 \\ e & 0 & -2 & 1 \end{pmatrix}$$

$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix}$ is a 2 rows by 3 columns matrix.

$\begin{pmatrix} -2 & 0 & -1 & 2/3 \\ 4 & 0 & 3 & 2 \\ e & 0 & -2 & 1 \end{pmatrix}$ is a 3 rows by 4 columns matrix.

So, They can multiply. The result will be 2 rows by 4 column matrix.

$$\begin{pmatrix} 0 & 1 & 2 \\ \pi & 0 & 5 \end{pmatrix} \begin{pmatrix} -2 & 0 & -1 & 2/3 \\ 4 & 0 & 3 & 2 \\ e & 0 & -2 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 9.436 & 0 & -1 & 4 \\ 7.306 & 0 & -13.14 & 7.095 \end{pmatrix}$$

3.(a)

$$\begin{pmatrix} 0 & 3 & 2 \\ 4 & 0 & -1 \end{pmatrix} \begin{pmatrix} -2 & 0 & -1 & 1 \\ 4 & 1 & 0 & -1 \\ -1 & 5 & 2 & 3 \end{pmatrix}$$

$$= \begin{pmatrix} 10 & 13 & 4 & 3 \\ -7 & -5 & -6 & 1 \end{pmatrix}$$

3.(b)

$$\begin{pmatrix} 0 & 3 & 2 \\ 4 & 0 & -1 \end{pmatrix} \begin{pmatrix} 9 \\ -24 \\ 36 \end{pmatrix}$$

$$= \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

3.(c)

$$\begin{pmatrix} 1 & -2 & 3 \\ 4 & -5 & -6 \\ 0 & -3 & 18 \end{pmatrix} \begin{pmatrix} -108 & 36 & 27 \\ -72 & 24 & 18 \\ -12 & 4 & 3 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

3.(d)

$$\begin{pmatrix} 5 & 6 \\ -7 & 8 \end{pmatrix} \begin{pmatrix} 1/2 & 0 \\ -3/2 & 4 \end{pmatrix}$$

$$= \begin{pmatrix} -6.5 & 24 \\ -15.5 & 32 \end{pmatrix}$$