1. (a) \((1 \ 2 \ 3) \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix} = \)

(b) \((4 \ 5 \ 6) \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix} = \)

(c) \(\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix} = \)

(Hint: if you are clever, you don’t have to compute much...)

2. (a) \((-2) \begin{pmatrix} 1 \\ 4 \end{pmatrix} = \)

(b) \(3 \begin{pmatrix} 2 \\ 5 \end{pmatrix} = \)

(c) \(1 \begin{pmatrix} 3 \\ 6 \end{pmatrix} = \)

(d) \(\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \\ 1 \end{pmatrix} = \)

(Hint: if you are clever, you can use the results from (a)–(c))

3. (a) \(\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} -1 & -2 \\ 2 & 3 \\ 1 & 1 \end{pmatrix} = \)

(Hint: if you are clever...)

(b) \(\begin{pmatrix} 1 \\ -1 \\ 4 \end{pmatrix} \begin{pmatrix} 1 & -3 & -2 \end{pmatrix} = \)

(c) \(\begin{pmatrix} 3 \\ 2 \\ -1 \end{pmatrix} \begin{pmatrix} 2 & 4 & 1 \end{pmatrix} = \)

(d) \(\begin{pmatrix} 1 & 3 \\ -1 & 2 \\ 4 & -1 \end{pmatrix} \begin{pmatrix} 1 & -3 & -2 \\ 2 & 4 & 1 \end{pmatrix} = \)

(If you are clever...)
4. The following are meant to remind you how to solve linear systems:

(a) Solve

\[
\begin{align*}
2x - y + 3z &= -10 \\
-4x + 3y - 8z &= 26 \\
-2x + 4y - 12z &= 34
\end{align*}
\]

- Take the multipliers and place them in the following lower triangular matrix, in the element that corresponds to the one that was eliminated in the above Gaussian elimination steps:

\[
L = \begin{pmatrix}
1 & 0 & 0 \\
1 & 0 \\
1 &
\end{pmatrix}
\]

- Take the left-hand size coefficients of the system after you reduced it to upper-triangular form and fill those coefficients in the following upper triangular matrix:

\[
U = \begin{pmatrix}
0 & & \\
0 & 0 & \\
0 & 0 &
\end{pmatrix}
\]

- Compute \( L \times U \). Compare the results with the coefficients in the linear system.

(b) Solve

\[
\begin{align*}
-x_0 - x_1 + 3x_2 &= 6 \\
-2x_0 + 6x_2 &= -14 \\
2x_0 + 8x_1 - 8x_2 &= 10
\end{align*}
\]

- Take the multipliers and place them in the following lower triangular matrix, in the element that corresponds to the one that was eliminated in the above Guassian elimination steps:

\[
L = \begin{pmatrix}
1 & 0 & 0 \\
1 & 0 \\
1 &
\end{pmatrix}
\]

- Take the left-hand size coefficients of the system after you reduced it to upper-triangular form and fill those coefficients in the following upper triangular matrix:

\[
U = \begin{pmatrix}
0 & & \\
0 & 0 & \\
0 & 0 &
\end{pmatrix}
\]

- Compute \( L \times U \). Compare the results with the coefficients in the linear system.