4. Compute

(a) $2\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \\ 4 \end{pmatrix}$

(b) $3\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \\ 6 \end{pmatrix}$

(c) $(-1)\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix} = \begin{pmatrix} -1 \\ 0 \\ -2 \end{pmatrix}$

(d) $\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}\begin{pmatrix} 2 & 3 & -1 \end{pmatrix} = \begin{pmatrix} 2 & 3 & -1 \\ 0 & 0 & 0 \\ 4 & 6 & -2 \end{pmatrix}$

(e) $\begin{pmatrix} -3 \\ 0 \\ 1 \end{pmatrix}\begin{pmatrix} 1 & -2 & -1 \end{pmatrix} = \begin{pmatrix} -3 & 6 & 3 \\ 0 & 0 & 0 \\ 1 & -2 & -1 \end{pmatrix}$

(f) $\begin{pmatrix} 1 & -3 \\ 0 & 0 \\ 2 & 1 \end{pmatrix}\begin{pmatrix} 2 & 3 & -1 \\ 1 & -2 & -1 \end{pmatrix} = \begin{pmatrix} -1 & 9 & 2 \\ 0 & 0 & 0 \\ 5 & 4 & -3 \end{pmatrix}$

(g) Which of the three algorithms for computing $C := AB$ do parts (d)-(f) illustrate? (Circle the correct one.)

- Matrix-matrix multiplication by columns.
- Matrix-matrix multiplication by rows.
- Matrix-matrix multiplication via rank-1 updates.