1. Compute these matrix multiplications:

(a) $\begin{bmatrix} 2 & -1 \\ 5 & 4 \\ 7 & -4 \end{bmatrix} \begin{bmatrix} 2 & -1 & -2 \\ 3 & 5 & 1 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & -1 & -2 \\ 3 & 5 & 1 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 5 & 4 \\ 7 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} -3 & 1 \\ 6 & 5 \end{bmatrix} \begin{bmatrix} 4 & -3 \\ 1 & -1 \end{bmatrix}$

(d) $\begin{bmatrix} 3 & 1 & 2 \\ -2 & -1 & 3 \\ 7 & 2 & 5 \end{bmatrix} \begin{bmatrix} 1 & 2 & 4 \\ 8 & 3 & 8 \\ 2 & 1 & 0 \end{bmatrix}$

2. Suppose we have two linear transformations $L_1 : \mathbb{R}^3 \longrightarrow \mathbb{R}^2$ and $L_2 : \mathbb{R}^2 \longrightarrow \mathbb{R}^3$ given by these formulas:

$$L_1(x, y, z) = (7x + 3z, 2x + y + 8z) \quad \text{and} \quad L_2(u, v) = (4u + v, 2u + 3v, -u + 5v)\,.$$

(a) Give the formulas for the composite function $L = L_2 \circ L_1$.

(b) Using these formulas, find the standard matrix C for L.

(c) Find the standard matrix A for L_1 and B for L_2.

(d) Compute the matrix product BA showing the details of how you computed the entries. (You should, of course, get the matrix C as an answer.)

3. Let $L : \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Prove that L is surjective if and only if it is injective.