\( V = \mathbb{R}^3 \) with basis \( B_1 = \left\{ \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix} \right\} \)

\( W = \mathbb{R}^2 \) with basis \( B_2 = \left\{ \begin{bmatrix} 5 \\ 3 \end{bmatrix}, \begin{bmatrix} 4 \\ 6 \end{bmatrix} \right\} \)

\( T \) is a linear transformation from \( V \) to \( W \), and is given by:

\[
T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x + y \\ z \end{pmatrix}
\]

1) Using the information above, find a formula for \( T \) that allows us to compute \( T(\vec{x}) \) when \( \vec{x} \) is expressed in the natural basis of \( V \). You do not need to simplify the formula.

2) Suppose a linear transformation \( T \) goes from \( \mathbb{R}^{12} \) to \( \mathbb{R}^4 \), and it is known that \( A\vec{x} = \vec{b} \) has no solutions when \( \vec{b} = \begin{bmatrix} 1 & 2 & 3 & 5 \end{bmatrix}^T \). What is the determinant of \([T]^T[T]\)?

(Here \( A \) is the matrix representing \( T \))