

Name: .....

- (a) How many rows and columns must a matrix  $A$  have in order to define a linear transformation  $T: \mathbb{R}^7 \rightarrow \mathbb{R}^3$  by the rule  $T(\mathbf{x}) = A\mathbf{x}$  ?

Rows = .....

Columns = .....

- (b) Find the standard matrix of the linear transformation  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^4$  such that:

$$T\left(\begin{bmatrix} 1 \\ 0 \end{bmatrix}\right) = \begin{bmatrix} 3 \\ 1 \\ 3 \\ 1 \end{bmatrix} \quad \text{and} \quad T\left(\begin{bmatrix} 0 \\ 1 \end{bmatrix}\right) = \begin{bmatrix} -5 \\ 2 \\ 0 \\ 0 \end{bmatrix}.$$

- (c) Find the standard matrix of the linear transformation  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$  such that:

$$T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}\right) = \begin{bmatrix} x_1 - 5x_2 + 4x_3 \\ x_2 - 6x_3 \end{bmatrix}.$$