Name: Solutions

Consider the following linear transformation L mapping $\mathbb{R}^3$ into $\mathbb{R}^2$:

$$L\begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} x_2 - x_1 \\ x_3 - x_2 \end{pmatrix}.$$

Find a matrix A such that $L(\mathbf{x}) = A\mathbf{x}$ for every $\mathbf{x}$ in $\mathbb{R}^3$.

$$L(\bar{e}_1) = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

$$L(\bar{e}_2) = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$L(\bar{e}_3) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$\Rightarrow A = \begin{pmatrix} -1 & 1 & 0 \\ 0 & -1 & 1 \end{pmatrix}.$$