Homework 2.4.1.2 Let L be a Linear transformation such that $L\left(\begin{pmatrix}1\\0\end{pmatrix}\right) = \begin{pmatrix}3\\5\end{pmatrix}$ and $L\left(\begin{pmatrix}0\\1\end{pmatrix}\right) = \begin{pmatrix}2\\-1\end{pmatrix}$

Then $L\left(\begin{pmatrix}2\\3\end{pmatrix}\right) = ?$

$$\begin{pmatrix}2\\3\end{pmatrix} = 2e_0 + 3e_1$$

$$L\left(\begin{pmatrix}2\\3\end{pmatrix}\right) = L\left(2e_0 + 3e_1\right)$$

$$= 2L(e_0) + 3L(e_1)$$

$$= 2\begin{pmatrix}3\\5\end{pmatrix} + 3\begin{pmatrix}2\\-1\end{pmatrix}$$

$$= \begin{pmatrix}6\\10\end{pmatrix} + \begin{pmatrix}6\\-3\end{pmatrix}$$

$$= \begin{pmatrix}12\\7\end{pmatrix}$$