Math 320 Linear Algebra
Assignment # 11

1. In each case find Rep(T), the matrix of the linear transformation, T.
   (a) $T : \mathbb{R}^3 \to \mathbb{R}^2$ defined by:

$$T\left(\begin{bmatrix}3\\2\\1\end{bmatrix}\right) = \begin{bmatrix}-8\\14\end{bmatrix}, \qquad T\left(\begin{bmatrix}-1\\0\\1\end{bmatrix}\right) = \begin{bmatrix}-8\\-14\end{bmatrix}, \qquad T\left(\begin{bmatrix}0\\0\\1\end{bmatrix}\right) = \begin{bmatrix}-2\\-14\end{bmatrix}$$

   (b) $T : \mathbb{R}^2 \to \mathbb{R}^2$ where $T(\vec{v})$ is $\vec{v}$ after its be rotated by $60°$ clockwise.

2. Suppose W, V, U be vector spaces, and T_1 and T_2 be linear transformation, with $T_1 : W \to V$ and $T_2 : V \to U$. Show that:
   (a) $\mathscr{R}(T_2 \circ T_1) \leq \mathscr{R}(T_2)$
   (b) $\mathscr{N}(T_1) \leq \mathscr{N}(T_2 \circ T_1)$
   (Note to show that for example $\mathscr{R}(T_2 \circ T_1) \leq \mathscr{R}(T_2)$ it is enough to show that every element of $\mathscr{R}(T_2 \circ T_1)$ is in $\mathscr{R}(T_2)$ (since we already know that both are vector spaces you only need to show the subset part))