**Name:** ______________________________ ________ **/ 10**

There are 10 points possible on this quiz. You may use technology but you must demonstrate what you are using technology for.

Questions below concern bases of $\mathbb{R}^2$

$$\mathscr{E}_2 = \left\langle \begin{pmatrix}1\\0\end{pmatrix}, \begin{pmatrix}0\\1\end{pmatrix} \right\rangle, \qquad B = \left\langle \begin{pmatrix}0\\-1\end{pmatrix}, \begin{pmatrix}2\\1\end{pmatrix} \right\rangle, \qquad D = \left\langle \begin{pmatrix}1\\1\end{pmatrix}, \begin{pmatrix}-1\\1\end{pmatrix} \right\rangle.$$

1. (2 points) Find **directly** the representation of the vector $\vec{v}$ with respect to $\mathscr{E}_2$ assuming $Rep_B(\vec{v}) = \begin{pmatrix}2\\3\end{pmatrix}_B$.

2. (2 points) Find the matrix $A_1 = Rep_{B,\mathscr{E}_2}(id)$.

3. (1 point) Use matrix $A_1$ to find $Rep_{\mathscr{E}_2}(\vec{v})$.

4. (5 points) Suppose that, with respect to $\mathscr{E}_2$ for both domain and codomain, the transformation $h : \mathbb{R}^2 \to \mathbb{R}^2$ is represented by the matrix $H = \begin{pmatrix} 6 & -8 \\ 2 & -8 \end{pmatrix}$. Use change of basis matrices to represent $h$ with respect to the bases

$$B = \left\langle \begin{pmatrix} 0 \\ -1 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \end{pmatrix} \right\rangle \quad \text{and} \quad D = \left\langle \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ 1 \end{pmatrix} \right\rangle.$$

where $B$ is the basis for the domain and $D$ is the basis for the range.