Group #: ________ Members: ______________________________ Rating: __________

1. (2 points) Let $b_1 = \begin{bmatrix} -1 \\ 8 \end{bmatrix}$, $b_2 = \begin{bmatrix} 1 \\ -7 \end{bmatrix}$, $c_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $c_2 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ be such that $\mathcal{B} = \{b_1, b_2\}$ and $\mathcal{C} = \{c_1, c_2\}$ are two bases for $\mathbb{R}^2$. Given that $[x]_{\mathcal{B}} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$, find $[x]_{\mathcal{C}}$.

2. (4 points) In $\mathbb{P}_2$, find the change-of-coordinates matrix from the basis $\mathcal{B} = \{1 - 3t^2, 2 + t - 5t^2, 1 + 2t\}$ to the standard basis. Then write t^2 as a linear combination of the polynomials in $\mathcal{B}$.

3. (4 points) Let $\mathcal{D} = \{\mathbf{d}_1, \mathbf{d}_2, \mathbf{d}_3\}$ and $\mathcal{F} = \{\mathbf{f}_1, \mathbf{f}_2, \mathbf{f}_3\}$ be bases for a vector space V, and suppose $\mathbf{f}_1 = 2\mathbf{d}_1 - \mathbf{d}_2 + \mathbf{d}_3$, $\mathbf{f}_2 = 3\mathbf{d}_2 + \mathbf{d}_3$, and $\mathbf{f}_3 = -3\mathbf{d}_1 + 2\mathbf{d}_3$.
   (a) (2 points) Find the change-of-coordinates matrix from $\mathcal{F}$ to $\mathcal{D}$.
   (b) (2 points) Find $[\mathbf{x}]_{\mathcal{D}}$ for $\mathbf{x} = \mathbf{f}_1 - 2\mathbf{f}_2 + 2\mathbf{f}_3$.