Name: _____

Section: _____

1. Find a basis for the column space of A, where A is the matrix given below. What is the rank of the linear transformation $\mathbf{x} \mapsto A\mathbf{x}$? (The rank of a linear transformation T is the dimension of the range of T).

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -2 & 2 \\ -1 & 4 & -9 \end{bmatrix}$$

2. Consider the basis $\mathcal{B} = \{1, 1+x, 1+x+x^2\}$ for $\mathbb{P}_2$. Suppose $\mathbf{x} \in \mathbb{P}_2$ is such that $[\mathbf{x}]_{\mathcal{B}} = (1, 0, 2)^T$. What is $\mathbf{x}$?

3. Find the coordinates of the vector $(1, 0)^T$ with respect to the basis $\{(2, 1)^T, (1, 2)^T\}$ for $\mathbb{R}^2$.