Math 4377
February 1, 2019 Homework 3 Name ______________________

1. Let

$$\mathbf{v}_1 = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}, \ \mathbf{v}_2 = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}, \ \mathbf{v}_3 = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}, \ \mathbf{b}_1 = \begin{bmatrix} 3 \\ 3 \\ 6 \end{bmatrix}, \ \mathbf{b}_2 = \begin{bmatrix} 2 \\ 6 \\ 2 \end{bmatrix}$$

   (a) Determine whether $\mathbf{b}_1$ is in $Span\{\mathbf{v}_1,\ \mathbf{v}_2,\ \mathbf{v}_3\}$.

   (b) Determine whether $\mathbf{b}_2$ is in $Span\{\mathbf{v}_1,\ \mathbf{v}_2,\ \mathbf{v}_3\}$.

   (c) If $\mathbf{b}_1$ or $\mathbf{b}_2$ is in $Span\{\mathbf{v}_1,\ \mathbf{v}_2,\ \mathbf{v}_3\}$, find weights $x_1,\ x_2,\ x_3$ such that $\mathbf{b}_i = x_1\mathbf{v}_1 + x_2\mathbf{v}_2 + x_3\mathbf{v}_3$.

2. Determine which of the following sets are bases for $P_2(\mathbb{R})$

   (a) $\{1 + 4x - x^2,\ 2 - 2x + 18x^2,\ -1 + x - 9x^2\}$.

   (b) $\{-1 + 3x - 2x^2,\ 2 - 4x - 5x^2,\ 4 - 10x - 6x^2\}$.

   (c) $\{1 - 2x + x^2,\ -2 + 3x - x^2,\ -2 - x + 6x^2\}$.

3. Find a subset of S which is a basis for the span of S, if

$$S = \left\{ \begin{bmatrix} -3 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 6 \\ -2 \\ -4 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 8 \end{bmatrix}, \begin{bmatrix} -7 \\ -1 \\ -4 \end{bmatrix} \right\}$$

4. Let S be the subspace of $M_{3\times 3}(\mathbb{R})$ which consists of all 3×3 real symmetric matrices ($A^T = A$). Find a basis for S. What is the dimension of S?