

Homework - July 5  
Section 4.4

2.  $\mathbf{x} = 8 \begin{bmatrix} 4 \\ 5 \end{bmatrix} - 5 \begin{bmatrix} 6 \\ 7 \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}.$

10.  $P_{\mathcal{B}} = \begin{bmatrix} 3 & 2 & 8 \\ -1 & 0 & -2 \\ 4 & -5 & 7 \end{bmatrix}.$

32.  $[\mathbf{p}_1]_{\mathcal{B}} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, [\mathbf{p}_2]_{\mathcal{B}} = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix},$  and  $[\mathbf{p}_3]_{\mathcal{B}} = \begin{bmatrix} 1 \\ 2 \\ -4 \end{bmatrix}.$

a) The vectors  $\mathbf{p}_1$ ,  $\mathbf{p}_2$ , and  $\mathbf{p}_3$  form a basis if the matrix  $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & -1 & 2 \\ 1 & 3 & -4 \end{bmatrix}$

is invertible, by IMT.  $A \sim \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}.$  This matrix has a pivot in every row, so by the Invertible Matrix Theorem, the columns of the matrix form a spanning set and are also linearly independent.

b)  $\mathbf{q}(t) = -3(1 - t^2) + 1(2 - t + 3t^2) + 2(1 + 2t - 4t^2)$