Name: _____ Date: 23 April 2009

QUIZ 8

1. Find the coordinate vector $[x]_{\mathcal{B}}$ of x relative to the given basis $\mathcal{B} = \{b_1, b_2, b_3\}$ where:

$$x = \begin{bmatrix} 8 \\ -9 \\ 6 \end{bmatrix}, b_1 = \begin{bmatrix} 1 \\ -1 \\ -3 \end{bmatrix}, b_2 = \begin{bmatrix} -3 \\ 4 \\ 9 \end{bmatrix}, b_3 = \begin{bmatrix} 2 \\ -2 \\ 4 \end{bmatrix}$$

Solution: We need weights c_1, c_2, c_3 where $x = \sum c_i b_i$. So we are solving the matrix equation:

$$\begin{bmatrix} 1 & -3 & 2 \\ -1 & 4 & -2 \\ -3 & 9 & 4 \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 8 \\ -9 \\ 6 \end{bmatrix}.$$

Creating the augmented matrix associated to this equation and row reducing we see:

$$c_1 = -1, c_2 = -1, c_3 = 3.$$

Thus the coordinate is given by:

$$[x]_{\mathcal{B}} = \begin{bmatrix} -1 \\ -1 \\ 3 \end{bmatrix}.$$