PRINT Your Name:_____

Quiz for June 21, 2005

Express $v = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ in terms of

$$u_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad u_2 = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}, \quad u_3 = \begin{bmatrix} -1 \\ 2 \\ -1 \end{bmatrix}.$$

You might want to notice that u_1, u_2, u_3 is an orthogonal set of vectors.
ANSWER: Multiply $v = c_1u_1 + c_2u_2 + c_3u_3$ by u_1^{T} to see $2 = 3c_1$, by u_2^{T} to see $-1 = 2c_2$, and by u_3^{T} to see $1 = 6c_3$. We check that

$$\frac{2}{3}u_1 - \frac{1}{2}u_2 + \frac{1}{6}u_3 = \frac{2}{3}\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \frac{1}{2}\begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix} + \frac{1}{6}\begin{bmatrix} -1 \\ 2 \\ -1 \end{bmatrix} = \frac{1}{6}\begin{bmatrix} 6 \\ 6 \\ 0 \end{bmatrix} = v\checkmark$$