Math 2418 Linear Algebra Quiz #5
Oct. 10-11, 2001

[8] 1a.) Show that $T((x_1, x_2)) = (x_1, x_1 + x_2, 3x_1 - 4x_2)$ is linear by finding a matrix A such that $T(x) = Ax$.

$$A \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_1 + x_2 \\ 3x_1 - 4x_2 \end{bmatrix}$$

$$\begin{bmatrix} & \\ & \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_1 + x_2 \\ 3x_1 - 4x_2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 3 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_1 + x_2 \\ 3x_1 - 4x_2 \end{bmatrix}$$

Answer 1a.) $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 3 & -4 \end{bmatrix}$

[3] 1b.) The domain of T is $\underline{R^2}$.

[3] 1c.) The codomain of T is $\underline{R^3}$.

[3] 1d.) Is T one-to-one?$\underline{yes}$

[3] 1e.) Is T onto?$\underline{no}$