Math02B Assignment VIII Name_____

Give complete solutions to the following problems. Be sure to provide all the necessary steps to support your answers.

1. Determine if $T(x,y,z) = (3x - 4y, 2x - 5z)$ is a linear operator.

2. Find the a basis for the Kernel of the given linear transformation defined by
$T(x_1, x_2, x_3) = (x_1 + x_2, -x_1 + x_2, 2x_2 + x_3)$

3. Let $u = (2,1,3)$, use matrix multiplication to find
   a) the reflection of ***u*** about the yz plane.
   b) rotation of ***u*** on the x axis
   c) The projection of u onto the space spanned by the vector (1,1,1).

4. Let $T(x_1, x_2, x_3) = (x_1 + 2x_2, x_1 - x_3)$ be a linear transformation

   a) Find the domain and the co-domain of T
   b) Find the standard matrix for T

5. Given $T(1,0,0) = (1,1,1), T(0,1,0) = (-1,0,1), T(0,0,1) = (1,1,2)$
   find the standard matrix [T] for T and use it to find T(3,2,2)

6. Find the projection of $\mathbf{w} = (2,1,2)$ onto $\mathbf{u} \times \mathbf{v}$ given $\mathbf{v} = (3,1,1), \mathbf{u} = (-1,2,3)$

7. Prove that the given linear operator T defined the system below is one to one, then Find $T^{-1}(1,1,1)$

$$w_1 = x_1 + 2x_2 + x_3$$
$$w_2 = -2x_1 + x_2 + 4x_3$$
$$w_3 = 7x_1 + 4x_2 - 6x_3$$