Spring 2008 Math 3260

Practice test #3

1. Is the transformation $T(x, y) = 5 - x + 2y$ linear? Justify your answer.
2. Is the transformation $T : R^2 \to R^3, T(x, y) = (x, 1)$ linear?
3. Find the standard matrix associated with the linear transformation by finding the value of T applied to the standard basis vectors.

$(a)\ T(x, y) = (x, -y)$; $(b)\ T(x_1, x_2, x_3, x_4) = 4x_1 + 6x_2 + 7x_3 + 8x_4$;

$(c)\ T(-1,1) = (3,0,-1), T(2,-1) = (0,-2,4)$

4. Determine if the transformation $T(x, y) = (3x + 3y, -x - y)$ is one-to-one. Is the range of T R^2? Justify your answer. If it is not, find a vector that is not in the range.
5. Construct a 2x2 matrix A such that the solution set of the equation $Ax = 0$ is the line in R^2 through the point (4,1) and the origin.
6. Determine whether $S = \{t^3 - 2t^2 + 1, t^2 - 4, t^3 + 2t, 5t\}$ is a basis for P_3.
7. Give a geometric description, find a basis and determine the dimension of the subspace $W = \{(2s - t, s, t) : s, t \in R\}$.
8. Find a basis for R^2 that includes the vector $(1,1)$.
9. Suppose $T : R^2 \to R^2$ is a linear operator. If $T(1, 2) = (-2, 3)$, $T(1, -1) = (5, 2)$ find the value of $T(7, 5)$ and find the matrix of T in the standard basis.
10. Suppose $T : R^2 \to R^3, T(x, y) = (x + y, x - y, 3x + 2y)$.
    a) Show that T is a linear transformation.
    b) Is T one-to-one?
    c) Is range(T) all of R^3? If not, find a vector that is not in the range(T).
11. Do the vectors $(1,1)$ and $(-2,-2)$ span R^2? Justify your answer. In case they do not, find a vector that is not in the span of the set above.