Philadelphia University

Department of Basic Sciences

Exam 2 **Linear Algebra 2** **30–12–2013**

Solutions must be complete in order to receive full credit.

1. (2 pts) Let $S = \{(x, y, x + y) \mid x, y \in R\}$. Is S a subspace of R^3? Why?
2. (3 pts) Let $T : R^4 \to R^6$ be given by

$$T(x, y, z, w) = (x + y, y, x, z + w, z, w)$$

   (a) What is the matrix of the linear transformation T?

   (b) What is the rank of T?

   (c) What is the nullity of T?

3. (3 pts) Find the matrix of transition for the change of basis from the old basis $\{(1, 1), (2, 0)\}$ to the new $\{(0, 3), (2, 1)\}$ for R^2.
4. (3 pts) Find all the eigenvalues of the matrix A, given that one of them is $k = 3$.

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

5. (3 pts) Find the eigenvectors of the matrix A which correspond to the eigenvalue $k = 2$.

$$A = \begin{bmatrix} 2 & 1 & 1 & -3 \\ 0 & 2 & 0 & 4 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 3 \end{bmatrix}$$

6. (6 pts) Evaluate A^{10} by diagonalizing the matrix A, given that the eigenvalues are $k = 0$ and $k = 4$.

$$A = \begin{bmatrix} 2 & -1 \\ -4 & 2 \end{bmatrix}$$

–Amin Witno