Philadelphia University

Department of Basic Sciences

Final Exam **Linear Algebra** **01–02–2015**

1. Solve the system of linear equations using Cramer's rule.

$$\begin{cases} 2x & -4y & = 13 \\ x & +3y & = -6 \end{cases}$$

2. Find A^{-1}.

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

3. Evaluate $\det A$.

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

4. Write the vector $(1, 2)$ as a linear combination of $(2, 1)$ and $(6, 5)$.

5. Given the old basis $\{(5, 0), (2, 1)\}$ and the new basis $\{(2, 4), (1, 3)\}$ for R^2: (a) Find the matrix of transition. (b) Find the new coordinates for $(0, 10)$ after the transformation.

6. Find the new equation of the line $y = 2x - 1$ under the linear transformation given by $T(x, y) = (x + 4y, 2x + 9y)$.

7. Find the eigenvalues and eigenvectors of the matrix A.

$$A = \begin{bmatrix} 5 & 0 & 0 \\ 1 & 3 & -2 \\ 1 & -2 & 3 \end{bmatrix}$$

8. The matrix A has eigenvalues $k = 1$ and $k = 2$. Compute A^{10} using the diagonalization method.

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

–Amin Witno