Assignement 2

Discrete Mathematical Structures

Q1. When doing a composite transformation, does the order in which you perform the transformations matter? Show with with suitable example.

Q2. What is vector space? Discuss the properties of vector space. Let V be the set of vectors $[2x - 3y, x + 2y, -y, 4x]$ with $x, y \in R^2$. Addition and scalar multiplication are defined in the same way as on vectors. Prove that V is a vector space.

Q3. Determine whether the function T: $R^2 \to R^2$ is linear transformation. If yes, prove it; if not, provide a counterexample to one of the properties:

$$T\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x + y \\ x - y \end{bmatrix}$$

Q4. Sketch the image of the square with vertices (0, 0), (3, 0), (3, 3), and (0, 3) under

(a) A reflection about the x-axis
(b) A reflection about the y-axis
(c) A compression of factor k=1/4 in the y-direction
(d) An expansion of factor k=2 in the x-direction
(e) A shear of factor k=3 in the x-direction
(f) A shear of factor k=2 in the y-direction

Q5. Use the decomposition theorem to find the chromatic polynomial of a complete graph with four nodes.

Q6. Explain Dijkastra's shortest path algorithm with suitable example.

Q7. Explain Ford-Fulkerson algorithm to find the maximum flow with example.

Q8. Write short note on:

a. Euler's formula for planar graph
b. Kuratoswki graphs
c. Chromatic numbers
d. Linear Transformation