Assignment 5

1. Verify whether T is a linear mapping. If T is linear, find Ker(T) and Im (T). Also verify rank and nullity of that linear mapping.

(i) $T : R^2 \to R^2$ **defined by** $T(x, y) = (x + y, x - y)$

(ii) $T : R^2 \to R^3$ **defined by** $T(x, y) = (x + 2y, 2x + y, x + y)$

(iii) $T : R^3 \to R^3$ **defined by** $T(x, y, z) = (yz, zx, xy)$

2. Determine the linear mapping $T : R^{33}$ **which maps the basis vectors** $(0, 1, 1), (1, 0, 1), (1, 1, 0)$ **of** R^3 **to** $(1, 1, 1), (1, 1, 1), (1, 1, 1)$ **respectively. Verify that dim(Ker** T**)+ dim(Im** T**)** $=$ **dim(**R^3**).**

3. A linear mapping $T : R^3 \to R^3$ **is defined by**

$T(x_1, x_2, x_3) = (3x_1 - 2x_2 + x_3, x_1 - 3x_2 - 2x_3)$. **Find the matrix of** T **relative to the ordered bases**

(i) $\{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ **of** R^3 **and** $\{(1, 0), (0, 1)\}$ **of** R^2

(ii) $\{(0, 1, 0), (1, 0, 0), (0, 0, 1)\}$ **of** R^3 **and** $\{(0, 1), (1, 0)\}$ **of** R^2

(iii) $\{(0, 1, 1), (1, 0, 1), (1, 1, 0)\}$ **of** R^3 **and** $\{(1, 0), (0, 1)\}$ **of** R^2