

MATH 311 WORKSHEET #2

(1) Find a basis for $\{\mathbf{x} \in \mathfrak{R}^3 : x_1 + x_2 + x_3 = 0\}$.

(2) Find a basis for $\{\mathbf{x} \in \mathfrak{R}^4 : x_1 + x_2 - x_4 = 0\}$.

(3) Find a basis for $\{\mathbf{x} \in \mathfrak{R}^4 : x_1 + 2x_2 + 3x_3 - x_4 = 0\}$.

(4) Find bases for the kernel and the range of the matrix

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

(5) Find bases for the kernel and the range of the matrix

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

- (6) Find bases for the kernel and the range of the matrix

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

- (7) Give examples of 3×3 matrices of rank 0,1,2,3.

- (8) Let \mathcal{P} denote the space of polynomials, D the differentiation operator, and I the identity operator. Find the kernels of D , D^2 and $D - I$.

- (9) Write a two-page essay on either (i) the kernel of a matrix, or (ii) the range of a matrix.