

**IGEE-UMBB**  
**EE 174 : Recitations set 6**

1. Given the matrix  $A = \begin{pmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix}$

a) Determine the rank and nullity of  $A$ ; What can you conclude about  $A$ ?

b) Find possible bases for the range space  $\mathcal{R}(A)$  and determine if  $Y = \begin{pmatrix} 2 \\ 0 \\ 0 \end{pmatrix}$  is a

vector of  $\mathcal{R}(A)$

c) Find a basis for the null space  $\mathcal{N}(A)$

2. Consider the matrix  $A = \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$  representing the linear transformation  $T$  in  $\mathbb{R}^2$

(a) What is this transformation geometrically?

b) Determine its rank and nullity; What do you conclude?

3. Let  $A = \begin{pmatrix} a_1 & a_2 & \dots & a_n \end{pmatrix}$  and  $B = \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{pmatrix}$ ; Compute  $AB$  and  $BA$  and comment

your result. What are the rank and nullity of  $BA$ ? Comment.

4. Consider the matrix  $A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{pmatrix}$

a) Compute the determinant of  $A$

b) Let the matrix  $B$  be obtained from  $A$  by replacing the second row of  $A$  by the sum of the second and third rows of  $A$ ; Compute  $\det(B)$  and comment.

c) Compute the inverse of  $A$  if it exists.