Tutorial letter 101/0/2024

Linear Algebra II

MAT2611

Year Module

Department of Mathematical Sciences

TUTORIAL RESOURCE FOR MAT2611

IMPORTANT INFORMATION:
This tutorial letter contains Assignment 5 for the module MAT2611

BAR CODE

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ASSIGNMENT 05
Due date: Thursday, 13 June 2024

Problem 17. Find the coordinate vectors for p relative to the basis
$S = \{p_1, p_2, p_3\}$ in P_2, where $p = 3 + 4x + 2x^2$; $p_1 = 1 + x$, $p_2 = 1 + x^2$ and $p_3 = x + x^2$.

[10 marks]

Problem 18. Discuss how the rank of A varies with t.

(a) $A = \begin{bmatrix} 1 & -1 & t \\ 1 & t & -1 \\ t^2 & 1 & -1 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1 & 1 & -t \\ t & 3 & -1 \\ 3 & 6 & -2 \end{bmatrix}$

[10 marks]

Problem 19. Let U and V be two subspaces of $\mathbf{R}^4$ defined by

$$U = \{(x_1, x_2, x_3, x_4) \in \mathbf{R}^4 : x_1 = x_2 \text{ and } x_3 = 2x_4\} \text{ and}$$
$$V = \{(x_1, x_2, x_3, 0) \in \mathbf{R}^4 : x_1 + x_2 = 0 \text{ and } x_3 = x_1 + x_2\}.$$

Find the dimensions of U and V.

[10 marks]

Problem 20. Find the rank and nullity of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 6 \\ 3 & 1 & 2 & 4 & -2 \\ 1 & -1 & 0 & -2 & -1 \\ 2 & 3 & 5 & -3 & 8 \\ 1 & 1 & 2 & 4 & 2 \end{bmatrix}$$

and verify Formula of Dimension Theorem for Matrices, that is,

$$rank\,(A) + nullity\,(A) = n,$$

where n is the number of columns in A.

[10 marks]

[Total: 40 marks]

– End of assignment –