

Department of Mathematics and Natural Sciences MAT216: Linear Algebra & Fourier Analysis Summer 2023

ASSIGNMENT 2

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yourself, mentioning your #name, #ID, and #section. (Compulsory)

1.	Determine which sets are vector spaces under the given operations. For those that are no
	vector spaces, list at least one axiom that fail to hold. $(2.5 \times 5 = 12.5)$

- (a) The set of all triples of real numbers (x, y, z) with the operations (x, y, z) + (x', y', z') = (x + x', y + y', z + z') and k(x, y, z) = (0, 0, 0).
- (b) The set of all pairs of real numbers of the form (x, y), where $x \ge 0$; with the standard operations on \mathbb{R}^2 .
- (c) The set of all pairs of real numbers (x, y) with the operations (x, y) + (x', y') = (x + x' + 1, y + y' + 1) and k(x, y) = (kx, ky).
- (d) The set of all pairs of real numbers of the form (1, x) with the operations (1, y) + (1, y') = (1, y + y') and k(1, y) = (1, ky).
- (e) The set of all positive real numbers with the operations x + y = xy and $kx = x^k$.
 - 2. Determine which of the following are subspace of the vector space V. (1.5 × 5 = 7.5)
- (a) All vectors of the form (a, 0, 0), where V = R³
 (b) All vectors of the form (a, b, c) with c = a b, where V = R³
- (c) All vectors of the form (a, b, c) with c = a + b + 3, where $V = \mathbb{R}^3$
- (d) All matrices $\Box a \ b$ 0, where $V = M_{2 \times 2}$

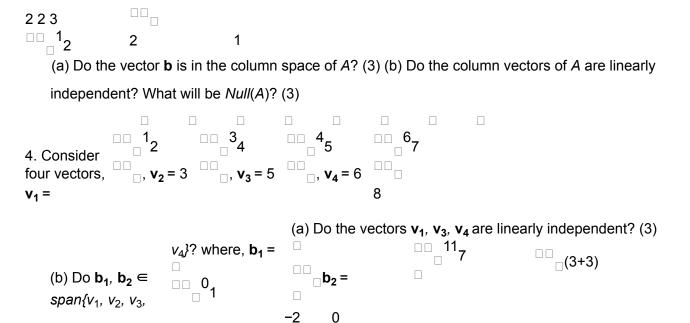
with a + b + c + d =

with $a + b + c + d = c d \square$

 $M_{2\times 2}$

(e) All matrices \Box a $^{\Box}$, where V =

-a -a 🗆 🗆



5. Calculate the Row(A), Col(A), Null(A) and $Null(A^T)$ (left nullspace of A) of the following matrix. (3 × 5 = 15)

(a)
$$A = \begin{bmatrix} 529 - 18 \\ 29 - 19 - 1 - 42 - 5 \\ 2130 - 1322 \end{bmatrix}$$
 (b) $A = \begin{bmatrix} (c) A = \\ -1452 \\ -1452 \\ -1452 \end{bmatrix}$