

Matrix theory Assignment 10

Shivangi Parashar

Abstract—This document contains the concept of vector space V over a field F .

Download all python codes from

https://github.com/shivangi-975/EE5609-Matrix_Theory/tree/master/Assignment10/Codes

Download latex-tikz codes from

https://github.com/shivangi-975/EE5609-Matrix_Theory/blob/master/Assignment10/Assignment_10.tex

1 PROBLEM

If V is a vector space over field F , verify that:

$$(\alpha_1 + \alpha_2) + (\alpha_3 + \alpha_4) = [\alpha_2 + (\alpha_3 + \alpha_1)] + \alpha_4$$

2 THEORY

vector space V is an Abelian group over field F on operation $+$ (vector addition) as it satisfies following properties.

Closure: If u and v are any vectors in V

$$u + v \in V.$$

Commutative law: $\forall u, v \in V$,

$$u + v = v + u$$

Associative law: $\forall u, v, w \in V$,

$$u + (v + w) = (u + v) + w$$

Additive identity: $\exists v \in V$,

$$0 + v = v$$

$$v + 0 = v$$

Additive inverses: $\forall v \in V$,

$$v + x = 0$$

$$x + v = 0$$

have a solution x in V , called an additive inverse of v , and denoted by $-v$.

3 SOLUTION

Using property of commutativity of $+$ in V

$$(\alpha_1 + \alpha_2) + (\alpha_3 + \alpha_4) = (\alpha_2 + \alpha_1) + (\alpha_3 + \alpha_4) \quad (3.0.1)$$

Using property of associativity of $+$ in V

$$(\alpha_2 + \alpha_1) + (\alpha_3 + \alpha_4) = \alpha_2 + [\alpha_1 + (\alpha_3 + \alpha_4)] \quad (3.0.2)$$

Using property of commutativity of $+$ in V

$$\alpha_2 + [\alpha_1 + (\alpha_3 + \alpha_4)] = \alpha_2 + (\alpha_3 + \alpha_1) + \alpha_4 \quad (3.0.3)$$

Using property of associativity of $+$ in V

$$\alpha_2 + (\alpha_3 + \alpha_1) + \alpha_4 = [\alpha_2 + (\alpha_3 + \alpha_1)] + \alpha_4 \quad (3.0.4)$$