Matrix theory Assignment 10

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***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 $\mathbf{V}$ is a vector space over field $\mathbf{F}$,verify that:

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

2 Theory

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

Closure law: If $\mathbf{u}$,$\mathbf{v}\in$ $\mathbf{V}$,

$$\mathbf{u} + \mathbf{v} \in \mathbf{V}$$

Commutative law: $\forall \mathbf{u}, \mathbf{v} \in \mathbf{V}$,

$$\mathbf{u} + \mathbf{v} = \mathbf{v} + \mathbf{u}$$

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

$$\mathbf{u} + (\mathbf{v} + \mathbf{w}) = (\mathbf{u} + \mathbf{v}) + \mathbf{w}$$

Additive identity: $\exists \mathbf{v} \in \mathbf{V}$,

$$0 + \mathbf{v} = \mathbf{v}$$
$$\mathbf{v} + 0 = \mathbf{v}$$

Additive inverses: $\forall \mathbf{v} \in \mathbf{V}$,

$$\mathbf{v} + \mathbf{x} = 0$$
$$\mathbf{x} + \mathbf{v} = 0$$

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

3 Solution

Using property of commutativity of '+' $\in$ $\mathbf{V}$

$$(\alpha_1 + \alpha_2) + (\alpha_3 + \alpha_4) = (\alpha_2 + \alpha_1) + (\alpha_3 + \alpha_4) \tag{3.0.1}$$

Using property of associativity of '+' in $\mathbf{V}$

$$(\alpha_2 + \alpha_1) + (\alpha_3 + \alpha_4) = \alpha_2 + [\alpha_1 + (\alpha_3 + \alpha_4)] \tag{3.0.2}$$

Using property of commutativity of '+' in $\mathbf{V}$

$$\alpha_2 + [\alpha_1 + (\alpha_3 + \alpha_4)] = \alpha_2 + (\alpha_3 + \alpha_1) + \alpha_4 \tag{3.0.3}$$

Using property of associativity of '+' in $\mathbf{V}$

$$\alpha_2 + (\alpha_3 + \alpha_1) + \alpha_4 = [\alpha_2 + (\alpha_3 + \alpha_1] + \alpha_4 \tag{3.0.4}$$