**Algebraic Properties of**

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| **Name** | **Description** | **Terms** |
| **Commutative** |  | * – Vectors * – Zero vector * – Real constants |
| **Inverse** |  |
| **Associative** (Vector Addition) |  |
| **Associative** (Scalar Multiplication) |  |
| **Distributive** **Law** (Vector Addition) |  |
| **Distributive** **Law** (Scalar Multiplication) |  |
| **Identity** (Vector Addition) |  |
| **Identity** (Scalar Multiplication) |  |

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| **Proof of Commutativity**   1. Suppose and are **any real vector in**  in the form:   and   1. By the **definition of vector addition**:      1. By the **commutative property of addition**:      1. By **vector addition and the definition of and** :   **(QED)** | **Proof of Inverse (Vector Addition)**   1. Suppose is **any** **real vector in**  in the form:   and   1. By the **definition of scalar multiplication**: 2. By the **definition of vector addition**:      1. By the **inverse property of addition**:      1. By **definition of the zero vector**:   **(QED)** |

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| **Proof of Associativity (Vector Addition)**   1. Suppose , , and are **any real vector in**  in the form:   and and   1. By the **definition of vector addition**:      1. By the **definition of vector addition**: 2. By the **associative property of addition**:      1. By the **definition of** **vector addition** and the **definition of and** :   **(QED)** | **Proof of Associativity (Scalar Multiplication)**   1. Suppose and are **any real number** and is **any real vector in**  in the form: 2. By the **definition of scalar multiplication**:      1. By the **definition of vector addition**: 2. By the **associative property of multiplication**: 3. By the **definition of** **scalar multiplication**:   **(QED)** |

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| **Proof of Distributive Law (Vector Addition)**   1. Suppose is **any real number** and and are **any real vector in**  in the form:   and   1. By the **definition of vector addition**:      1. By the **definition of scalar multiplication**:      1. By the **distributive law over addition**: 2. By the **vector addition**: 3. By the **definition of scalar multiplication**,and the **definition of and** :   **(QED)** | **Proof of Distributive Law (Scalar Multiplication)**   1. Suppose and are **any real number** and is **any real vector in**  in the form:      1. By the **definition of scalar multiplication**:      1. By the **distributive law over addition**:      1. By the **definition of vector addition**: 2. By the **definition of scalar multiplication** and the **definition of** :   **(QED)** |

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| **Proof of Identity (Vector Addition)**   1. Suppose is the **zero vector of length**  and is **any real vectors in**  in the form: 2. By the definition of **vector addition**:      1. By the **identity property of addition**:      1. By the **definition of** :   **(QED)** | **Proof of Identity (Scalar Multiplication)**   1. Suppose is **any real vectors in**  in the form: 2. By the definition of **scalar multiplication**:      1. By the **identity property of multiplication**:      1. By the **definition of** :   **(QED)** |