# AMS10 HW1

1. A vector space is a set V on which two operations, vector addition and scalar multiplication are defined. Find and cite a credible source that defines these operations. What are the conditions that must be satisfied?

The vector addition operation (+) must satisfy the following conditions:

(1) Commutative law: For all vectors $\vec{u}$ and $\vec{v}$ in V...

(2) Associative law: For all vectors $\vec{u}$,$\vec{v}$, and $\vec{w}$ in V...

(3) Additive identity: The set V contains an additive identity element, denoted by a $\mathbf{0}$, such that for any vector $\vec{v}$ in V...

(4) Additive inverses: For each vector $\vec{v}$ in V...

Note: *Closure*: If $\vec{u}$ and $\vec{v}$ are any vectors in V, then the sum $\vec{u} + \vec{v}$ belongs to V.

The scalar multiplication operation ($\cdot$) is defined between real numbers (or scalars) and vectors, and must satisfy the following conditions:

(5) Distributive law: For all real numbers $c$ and all vectors $\vec{u}, \vec{v}$ in V...

(6) Distributive law: For all real numbers $c, d$ and all vectors $\vec{v}$ in V...

(7) Associative law: For all real numbers $c, d$ and all vectors $\vec{v}$ in V...

(8) Unitary law: For all vectors $\vec{v}$ in V...

Note: *Closure*: If $\vec{v}$ is any vector in V, and $c$ is any real number, then the product $c \cdot \vec{v}$ belongs to V.

2. Draw the vector $\vec{a} - \vec{b}$ using the parallelogram law. Note that $\vec{a} - \vec{b} = \vec{a} + (-\vec{b})$,

3. a. Calculate the absolute value $|z|$ for the following complex numbers

i. $z = \frac{1}{2} + i\frac{\sqrt{3}}{2}$

ii. $z = 5 \cdot \frac{-\sqrt{2}}{2} + i5 \cdot \frac{\sqrt{2}}{2}$

b. Write down the complex exponential form of

i. $z = \frac{1}{2} + i\frac{\sqrt{3}}{2}$

ii. $z = 5 \cdot \frac{-\sqrt{2}}{2} + i5 \cdot \frac{\sqrt{2}}{2}$

(Hint: there are an infinite number of representations)

c. Use the complex exponential form of $z = 10\frac{\sqrt{3}}{2} + i10\frac{1}{2}$ to show that $x^2 = 10\frac{\sqrt{3}}{2} + i10\frac{1}{2}$ has only two distinct solutions.

4. Construct the following vectors in Matlab:

a. A 2x1 vector with all 1's in the entries and define it $u$.

b. A 2x1 vector with the first element 4 and the second element 3 and define it $v$

c. What is 5u+v? Verify using Matlab

Write down using Matlab syntax the exact expression you would type into the command window for a-c.