SECTION 1

C, Fields, Lists, F^n, Vector Spaces

Definition of complex numbers (n∊C)

C = { a+bi : a,b ∊ *R* }

addition in C (a+bi) + (c+di) = (a+c) + (b+d)i

multiplication in C (a+bi)(c+di) = (ac-bd) + (ad+bc)i

Properties of Fields

commutativity a+b = b+a ∧ ab = ba ∀a,b ∊ **F**

associativity (a+b)+c = a+(b+c) ∧ (ab)c = a(bc) ∀a,b,c ∊ **F**

identities c+0 = c ∧ 1c = c ∀c ∊ **F**

additive inverse ∀a ∊ **F** ∃b ∊ **F** : a+b = 0

multiplicative inverse a ∊ **F**, a ≠ 0, ∃b ∊ **F** : a+b = 0

distributive property c(a+b) = ca + cb ∀a,b,c ∊ **F**

Definition of list L with length n

n∊***N***, **L** : { 1,2,…,n } → Elements

L = $(x_1,...,x_n)$

Definition of Fn

F^n = { $(x_1,...,x_n)$: x_j ∊ *F* for j = 1,...,*n*}

addition in F^n $(x_1,...,x_n) + (y_1,...,y_n) = (x_1+y_1,...,x_n+y_n)$

zero vector *0* = (0,...,0)

additive inverse For *x* ∊ F^n, -*x* ∊ F^n = $(-x_1,...,-x_n)$

scalar multiplication in F^n c ∊ *F*, $c(x_1,...,x_n) = (cx_1,...,cx_n)$

Definition of addition and scalar multiplication

addition on a set V *+* : (*u*,*v* ∊ *V*) → *u* +*v*

scalar multiplication on a set V *** : (c ∊ *F*, *v* ∊ *V*) → c *v*

Defintion of Vector Space

Vector Space = *V* + (*+*) + (***)

commutativity *u*+*v* = *v*+*u*

associativity (*u*+*v*)+*w* = *u*+(*v*+*w*) ∧ (ab) *v* = a(b *v*)

additive identity ∃ *0* ∊ *V* : *v*+*0* = *v*

additive inverse ∀ *v* ∊ *V*, ∃ *w* ∊ *V* : *v*+*w* = *0*

multiplicative identity 1 *v* = *v*

distributive property a(*v*+*w*) = a*v* + a*w* ∀a ∊ **F**

v ∊ *V* = vector v point