R^n

$\mathbf{v} = v_1 v_2 v_n$

$\mathbf{v} =$
3
$-$
1
4
R^3
$\mathbf{u}, \mathbf{v} \in$
R^n

$\mathbf{u}+\mathbf{v} = u_1+v_1 u_2+v_2 u_n+v_n$

$\mathbf{v}$
c

$c\mathbf{v} = cv_1 cv_2 cv_n$

$\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_k$
$c_1\mathbf{v}_1+c_2\mathbf{v}_2+\ldots+c_k\mathbf{v}_k$

$\mathbf{v}_1 = 123, \mathbf{v}_2 = 456$

$c_1 =$
2
$c_2 =$
-1
$c_1\mathbf{v}_1+c_2\mathbf{v}_2 = 2123+(-1)456 = 246+-4-5-6 = -2-10$

$\mathbf{v}_1 = 12, \mathbf{v}_2 = 34, \mathbf{w} = 710$

c_1, c_2
$c_1\mathbf{v}_1+c_2\mathbf{v}_2 = \mathbf{w}$

$c_1(1)+c_2(3) = 7$

$c_1(2)+c_2(4) = 10$

$c_1 =$
2
$c_2 =$
1.67
$\mathbf{w}$
$\mathbf{v}_1 = 11, \mathbf{v}_2 = 22, \mathbf{w} = 34$

c_1, c_2
$c_1\mathbf{v}_1+c_2\mathbf{v}_2 = \mathbf{w}$

$c_1(1)+c_2(2) = 3$

$c_1(1)+c_2(2) = 4$

$\mathbf{w}$
$\mathbf{u}, \mathbf{v} \in$
R^n

$$\mathbf{u}\cdot\mathbf{v} = \sum_{i=1}^{n} u_i v_i$$

$\mathbf{u} = 123, \mathbf{v} = 4-56 \Rightarrow \mathbf{u}\cdot\mathbf{v} = (1)(4)+(2)(-5)+(3)(6) = 4-10+18 = 12$

$\mathbf{u}, \mathbf{v} \in$
C^n

$$\mathbf{u}\cdot\mathbf{v} = \sum_{i=1}^{n} u_i \overline{v_i}$$

$\overline{v_i}$
v_i
$\mathbf{u} = 1+i2-i, \mathbf{v} = 3-i1+2i$

$\mathbf{u}\cdot\mathbf{v} = (1+i)\overline{(3-i)}+(2-i)\overline{(1+2i)}$

$= (1+i)(3+i)+(2-i)(1-2i)$

$= (1\cdot3+1\cdot i+i\cdot3+i\cdot i)+(2\cdot1+2\cdot(-2i)-i\cdot1-i\cdot(-2i))$

$= (3+i+3i-1)+(2-4i-i+2)$

$= (2+4i)+(4-5i) = 6-i$

$\mathbf{u}, \mathbf{v}, \mathbf{w} \in$
C^n
α, β
$(\alpha\mathbf{u}+\beta\mathbf{v})\cdot\mathbf{w} = \alpha(\mathbf{u}\cdot\mathbf{w})+\beta(\mathbf{v}\cdot\mathbf{w})$

$\mathbf{u}, \mathbf{v} \in$
C^n
$\mathbf{u}\cdot\mathbf{v} = \overline{\mathbf{v}\cdot\mathbf{u}}$

$\mathbf{u} \in$
C^n
$\mathbf{u}\cdot\mathbf{u} \geq 0$

$\mathbf{u} =$
0
$\|\mathbf{u}\| = \sqrt{\mathbf{u}\cdot\mathbf{u}}$