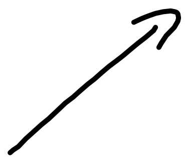
Gregg

Dr. }
Mr. } Waterman
Prof. }

Vector

Magnitude + direction



$$\begin{bmatrix} 3 \\ -1 \\ 2 \end{bmatrix} \rightsquigarrow \mathbb{R}^3 \quad \mathbb{C}^3$$

$$\langle 3,-1,2 \rangle$$

$$\begin{bmatrix} 2 \\ -3 \end{bmatrix} + \begin{bmatrix} 1 \\ 5 \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix} \qquad (3+2)\begin{bmatrix} 2 \\ -3 \end{bmatrix} = 3\begin{bmatrix} 2 \\ -3 \end{bmatrix} + 2\begin{bmatrix} 2 \\ -3 \end{bmatrix}$$

Dot product ⟶ yes, but later...

Cross product ⟶ 3D only

Addition

Scalar multiplication

$f : \mathbb{R} \to \mathbb{R}$

$(f+g)(x) = f(x) + g(x)$

$f(x) = x^2$

$(cf)(x) = c[f(x)]$

$g(x) = 2x+1$

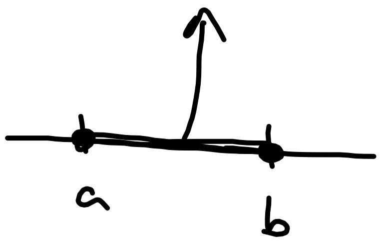
Scalar (c)

$0(x) = 0$

$(-f)(x) = -[f(x)]$

This space is all real-valued functions defined on $\mathbb{R}$. $\mathcal{F}$

$\mathcal{F}[a,b]$



$\tan x \in \mathcal{F}[-1,1]$

~~$\mathcal{F}(-\frac{\pi}{2},\frac{\pi}{2})$~~

Another vector space is $\mathcal{P}_2$.

$p(x) = ax^2 + bx + c$

$S = \{x^2+1, x^2+x, x+1\}$

Find a linear combination of vectors in S equalling $3x^2 - 5x + 2$. ______ = ____

$$c_1(x^2+1)+c_2(x^2+x)+c_3(x+1)=3x^2-5x+2$$

$$c_1x^2+c_1+c_2x^2+c_2x+c_3x+c_3=$$

$$c_1x^2+c_2x^2+c_2x+c_3x+c_1+c_3=3x^2-5x+2$$

$$c_1+c_2=3 \qquad c_1=5$$

$$c_2+c_3=-5 \qquad c_2=-2$$

$$c_1+c_3=2 \qquad c_3=-3$$

Waterman OIT

Due Wed

1.2: 1, 2, 6

$\vec{u}_1, \vec{u}_2, \vec{u}_3$

A linear combination $c_1\vec{u}_1 + c_2\vec{u}_2 + c_3\vec{u}_3$

$(3g)(x) = 3[g(x)] = 6x+3$

Vector space V

Set V of "vectors"
Set $\mathbb{F}$ of scalars → "Field" (For now, real numbers, or complex numbers)
+ for vectors
· for scalar + vector