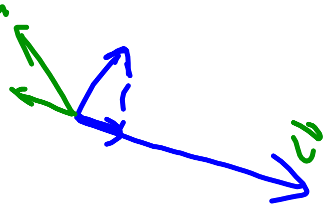
1 a) Plot $\vec{u} = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$
$\vec{v} = \begin{bmatrix} 5 \\ 2 \end{bmatrix}$

$$\text{proj}_{\vec{v}} \vec{u} = \frac{\vec{u} \cdot \vec{v}}{\vec{v} \cdot \vec{v}} \vec{V}$$

"screen"

$$\text{proj}_{\vec{v}} \vec{u} = \frac{\langle \vec{u}, \vec{v} \rangle}{\langle \vec{v}, \vec{v} \rangle} \vec{v}$$



b) Compute $\frac{\vec{u} \cdot \vec{v}}{\vec{v} \cdot \vec{v}}$ to
est tenth.

c) Find and plot $\frac{\vec{u} \cdot \vec{v}}{\vec{v} \cdot \vec{v}} \vec{v}$

(2) $\beta = \left\{ \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} \right\}$ is a basis for $\mathbb{R}^3$. Find

orthogonal basis

the representation of $\vec{u} = \begin{bmatrix} 3 \\ -6 \\ 2 \end{bmatrix}$ in terms of the basis.

$$\begin{bmatrix} 3 \\ -6 \\ 2 \end{bmatrix} = \frac{5}{2} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} - 6 \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} + \frac{1}{2} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$$

$\vec{u}$ $\quad\quad \mathcal{B} = \{\vec{v}_1, \vec{v}_2, \vec{v}_3\}$ is an orthogonal basis

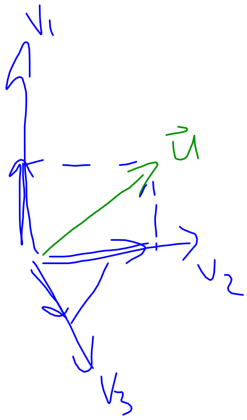
$$\vec{u} = c_1\vec{v}_1 + c_2\vec{v}_2 + c_3\vec{v}_3$$

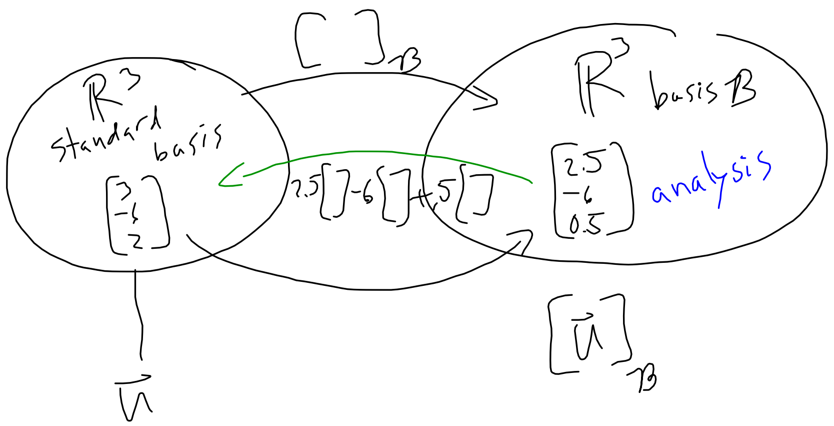
$$\langle \vec{v}_1, \vec{u} \rangle = \langle \vec{v}_1, c_1\vec{v}_1 + c_2\vec{v}_2 + c_3\vec{v}_3 \rangle \qquad \langle \vec{u}+\vec{v}, \vec{w} \rangle$$

$$= c_1 \langle \vec{v}_1, \vec{v}_1 \rangle + c_2 \cancelto{0}{\langle \vec{v}_1, \vec{v}_2 \rangle} + c_3 \cancelto{0}{\langle \vec{v}_1, \vec{v}_3 \rangle} \qquad \langle \cdot\ \vec{u}, \cdot \vec{v} \rangle$$

$$\frac{\langle \vec{v}_1, \vec{u} \rangle}{\langle \vec{v}_1, \vec{v}_1 \rangle} = c_1$$

$$\vec{u} = \underbrace{\frac{\langle \vec{v}_1, \vec{w} \rangle}{\langle \vec{v}_1, \vec{v}_1 \rangle}}\vec{v}_1 +$$




R^3
standard basis
R^3 basis B
analysis
2.5[ ] -6[ ] +.5[ ]
[ ]_B
[u]_B
u

2.2:9 $\quad T: M_{22} \to \mathbb{R}^2 \quad T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = \begin{bmatrix} a+d \\ b+d \end{bmatrix}$

$$\ker(T) = \left\{ \begin{bmatrix} a & a \\ c & -a \end{bmatrix} \right\} \qquad \text{ran}(T) = \mathbb{R}^2 \qquad \begin{array}{c} \parallel \\ \begin{bmatrix} 0 \\ 0 \end{bmatrix} \end{array}$$

$$\begin{bmatrix} 2 & 2 \\ 0 & -2 \end{bmatrix} \qquad a\begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix} + c\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$$

$$\mathcal{B}_{\ker(T)} = \left\{ \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \right\}$$

$a+d=0$

$d=-a$

$b+d=0$

$d=-b$

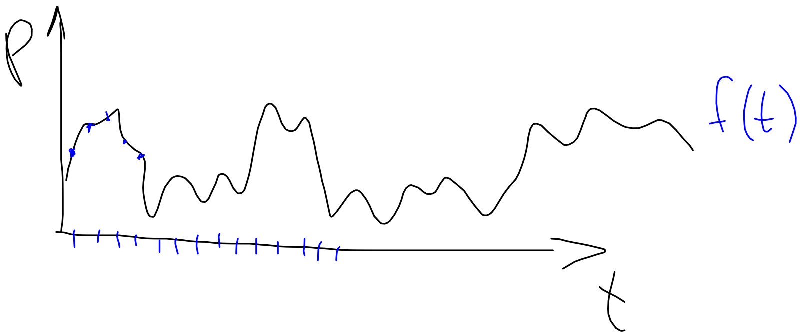
$b=a \quad -b=-a$

$$\vec{u} = \begin{bmatrix} 5 \\ -7 \\ 4 \end{bmatrix}$$

$: \{1,2,3\} \to \mathbb{R}$

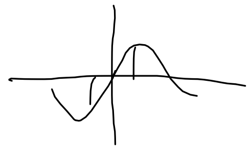
$u(1)=5,\ u(2)=-7$

$u(3)=4$



$$\begin{cases} f(0) \\ f(0.00001) \end{cases}$$

$$\int_{-a}^{a} f(x)\,dx = \begin{cases} 2\int_0^a f(x)\,dx & \text{if } f \text{ is even} \\ 0 & \text{if } f \text{ is odd} \end{cases}$$



$\sin 2\theta = 2\sin\theta\cos\theta$

$$\int_{-1}^{1} \sin \pi x \cos \pi x \, dx$$

or

$$\int_{-1}^{1} \frac{1}{2} \sin 2\pi x \, dx$$

Let $u = \sin \pi x$

$du = \pi \cos \pi x$

etc.