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Diketahui $<\vec{u},\vec{v}>= u_1v_1 + 8u_2v_2$ adalah hasil kali dalam Euclides di R^2 jika $\vec{a}=(1,1)$, $\vec{b}=(2,3)$, $\vec{c}=(0,1)$, dan $k=3$. Maka tentukan

1. $<\vec{a},\vec{b}>$
2. $<k\vec{a},\vec{b}>$
3. $<\vec{a}+\vec{b},\vec{c}>$
4. $|\vec{a}|$

1. $<\vec{a},\vec{b}> = a_1b_1 + 8a_2b_2$

$= 1.2 + 8.1.3$

$= 2 + 24$

$= 26$

2. $<k\vec{a},\vec{b}> = ka_1.b_1 + 8.ka_2.b_2$

$= 3.1.2 + 8.3.1.3$

$= 6 + 72$

$= 78$

3. $<\vec{a}+\vec{b},\vec{c}> = <(a_1+b_1, a_2+b_2),(c_1,c_2)>$

$= (a_1+b_1)c_1 + 8(a_2+b_2)c_2$

$= (1+2)0 + 8(1+3).1$

$= 0 + 32$

$= 32$

4. $\|\vec{a}\| = <\vec{a},\vec{a}>^{1/2}$

$= (a_1^2 + 8a_2^2)^{1/2}$

$= (1^2 + 8.1^2)^{1/2}$

$= (1+8)^{1/2}$

$= 9^{1/2}$

$= 3$

Diketahui $<\vec{u},\vec{v}>$ adalah hasil kali dalam Euclides R^3. Tentukan nilai k agar himpunan vektor dibawah ini saling orthogonal

1. $\vec{u} = (3, 5, -8),\ \vec{v} = (5, k, 5),$
2. $\vec{u} = (k, -3, 0),\ \vec{v} = (k, 3, 13),$

Syarat agar vektor dikatakan saling orthogonal adalah $<\vec{u},\vec{v}> = 0$

1. $<\vec{u},\vec{v}> = u_1v_1 + u_2v_2 + u_3v_3$

$0 = 3.5 + 5.k + (-8).5$

$0 = 15 + 5k - 40$

$0 = 5k - 25$

$5k = 25$

$k = 5$

2. $<\vec{u},\vec{v}> = u_1v_1 + u_2v_2 + u_3v_3$

$0 = k.k + (-3).3 + 0.13$

$0 = k^2 - 9 + 0$

$k^2 - 9 = 0$

$(k+3)(k-3) = 0$

$k_1 = -3 \qquad k_2 = 3$

Diketahui

$B = \{(0,-4,0),(5,12,0),(1,0,-2)\}$

Menggunakan proses Gramm Schmidt, transformasikan basis B menjadi basis orthonormal

$$B = \left\{ \begin{bmatrix} 0 \\ -4 \\ 0 \end{bmatrix}, \begin{bmatrix} 5 \\ 12 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix} \right\} \qquad \vec{u}_1 = \begin{bmatrix} 0 \\ -4 \\ 0 \end{bmatrix} \qquad \vec{u}_2 = \begin{bmatrix} 5 \\ 12 \\ 0 \end{bmatrix} \qquad \vec{u}_3 = \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix}$$

$$\vec{v}_1 = \frac{\vec{u}_1}{\|\vec{u}_1\|} = \frac{(0,-4,0)}{(0^2+(-4)^2+0^2)^{1/2}} = \frac{(0,-4,0)}{4} = \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix}$$

$$\vec{u}_2 - \text{proy}_{\vec{v}_1} \vec{u}_2 = \vec{u}_2 - \langle \vec{u}_2, \vec{v}_1 \rangle \vec{v}_1$$

$$= \begin{bmatrix} 5 \\ 12 \\ 0 \end{bmatrix} - (5.0 + 12.(-1) + 0.0) \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix}$$

$$= \begin{bmatrix} 5 \\ 12 \\ 0 \end{bmatrix} - \begin{bmatrix} 0 \\ 12 \\ 0 \end{bmatrix} = \begin{bmatrix} 5 \\ 0 \\ 0 \end{bmatrix}$$

$$\vec{u}_2 - \text{proy}_{\vec{v}_1} \vec{u}_2 = \sqrt{5^2+0^2+0^2} = 5$$

$$\vec{v}_2 = \frac{\vec{u}_2 - \text{proy}_{\vec{v}_1} \vec{u}_2}{\|\vec{u}_2 - \text{proy}_{\vec{v}_1} \vec{u}_2\|} = \frac{(5,0,0)}{5} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$\vec{u}_3 - \text{proy}_w \vec{u}_3 = \vec{u}_3 - \langle \vec{u}_3, \vec{v}_1 \rangle \vec{v}_1 - \langle \vec{u}_3, \vec{v}_2 \rangle \vec{v}_2$$

$$= \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix} - (1.0 + 0.(-1) + (-2).0). \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix} - (1.1 + 0.0 + (-2).0). \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} - \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ -2 \end{bmatrix}$$

$$\|\vec{u}_3 - \text{proy}_w \vec{u}_3\| = \sqrt{0^2 + 0^2 + (-2)^2} = 2$$

$$\vec{v}_3 = \frac{\vec{u}_3 - \text{proy}_w \vec{u}_3}{\|\vec{u}_3 - \text{proy}_w \vec{u}_3\|} = \frac{(0,0,-2)}{2}$$

$$= \begin{bmatrix} 0 \\ 0 \\ -1 \end{bmatrix}$$

$(\vec{v}_1, \vec{v}_2, \vec{v}_3) = \left\{ \begin{bmatrix} 0 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ -1 \end{bmatrix} \right\}$ merupakan basis orthonormal dari

basis B untuk ruang vektor R^3 dengan RHD Euclides