Vector dot product, length

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8:58 AM

dot product ≡ a scalar value

given 2 vector $\vec{a}, \vec{b}$, $\frac{\vec{a} \cdot \vec{b}}{\|\vec{a}\| \|\vec{b}\|} = \cos(\theta)$

$\|\vec{a}\|$: length of $\vec{a}$; $\|\vec{b}\|$: length of $\vec{b}$

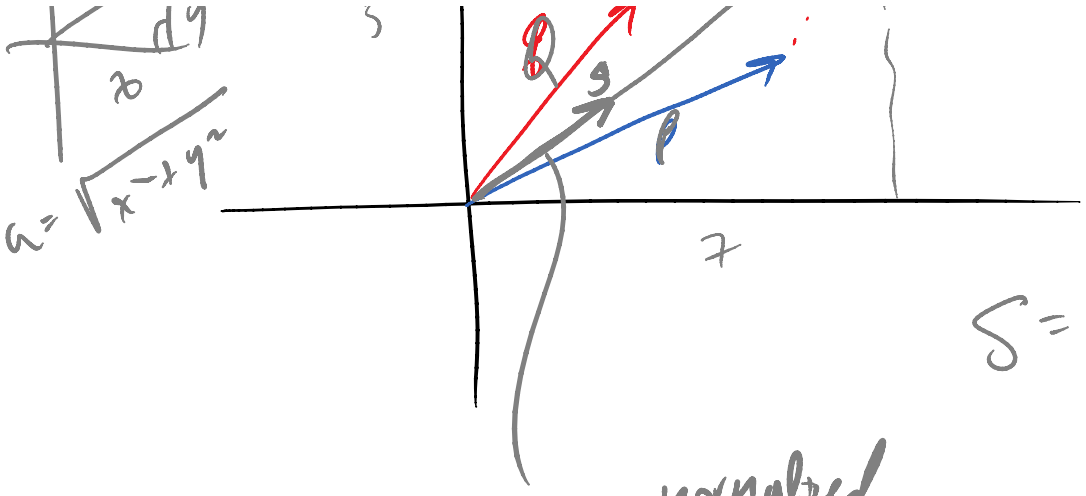
$\frac{\vec{a}}{\|\vec{a}\|}$ is the vector $\vec{a}$ scaled (multiplied by) 1/length,

where length $= \|\vec{a}\| = \sqrt{a_x^2 + a_y^2 + a_z^2}$

a normalized vector

$\Rightarrow \frac{\vec{a}}{\|\vec{a}\|}$ is now of unit length

($\frac{\vec{a}}{\|\vec{a}\|}$'s length is 1)

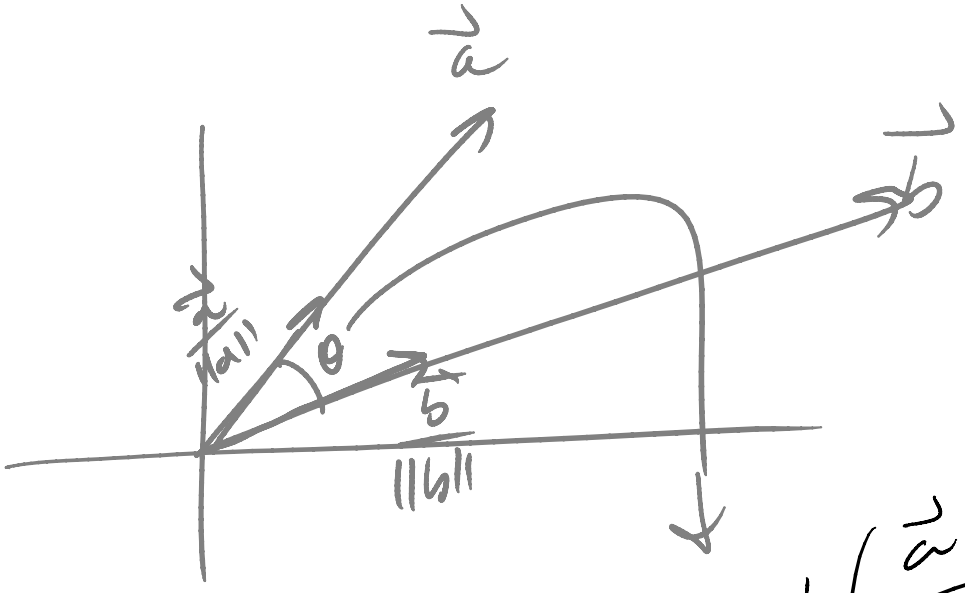


$= \sqrt{74}$

$$S = \frac{h}{\|h\|}$$

$$= \left(\frac{7}{\sqrt{74}}, \frac{5}{\sqrt{74}}\right)$$

$\|S\| = 1$ normalized vector.



$$\theta = \cos^{-1}\left(\frac{\vec{a}\cdot\vec{b}}{\|\vec{a}\|\,\|\vec{b}\|}\right)$$

$$a = \begin{pmatrix} a_x \\ a_y \\ a_z \end{pmatrix} \cdot \begin{pmatrix} b_x \\ b_y \\ b_z \end{pmatrix} = b$$

$$(a_x \times b_x) + (a_y \times b_y) + (a_z \times b_z)$$

dot = (a[0] * b[0]) + (a[1] * b[1]) + (a[2] * b[2])

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double sum = 0.0;
for(i=0; i<3; i++)
    sum += a[i] * b[i]
return (sum)
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What is a · a ?

$a_x * a_x + a_y * a_y + a_z * a_z$

sqrt(a · a) = length of a