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Assignment

(1)

given $|x|^2 = \langle x, x \rangle$

prove $|x+y|^2 = |x|^2 + |y|^2$

$$|x+y|^2 = (x+y)(x+y)$$

$$= |x||x| + |x||y| + |x||y| + |y||y|$$

$$= |x|^2 + 2.|x|.|y| + |y|^2$$

If $\vec{x}$ and y vector are

orthogonal then. $2|x||y|$

$$= 2.x.y.\cos\theta$$

$$= 2.x.y.\cos 90^\circ$$

$$= 0$$

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So

$|x+y|^2 = |x|^2 + |y|^2$

Assignment 2

$\|Ax\|^2 = \|x\|^2$

given. $\|ax\|^2 = (ax)^T (ax)$

$(ax)^T (ax) = x^T a^T . a . x$

$= x^T (a^T . a) x$

Let $A = a^T . a$

So, $\|Ax\|^2 = x^T . A . x$

Since A is scalar and non negative.

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Thus $Ax^T.x$ is equivalent to $\|x\|^2$.

Thus $\|Ax\|^2 = \|x\|^2$.

Assignment 3

$$\|Ax\|^2 . \|Ay\|^2 = (Ax.Ax)(Ay.Ay)$$

$$\|Ax\| \|Ay\| = \sqrt{\|Ax\|^2} . \sqrt{\|Ay\|^2}$$

$$= \sqrt{\|x\|^2} . \sqrt{\|y\|^2}$$

$$= \sqrt{(x).(x)} . \sqrt{(y).(y)}$$

$$= \sqrt{x.x.y.y}$$

$$= \sqrt{x^2} . \sqrt{y^2}$$

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$= 14.181.$ //