INNER PRODUCT SPACE:-

An inner product on a real vector space V is a function that associates a real number $\langle u, v \rangle$ with each pair of vectors u and v in V in such a way that the following axioms are satisfied for all vectors u, v and w in V and all scalars k.

1. $\langle u, v \rangle = \langle v, u \rangle$ [Symmetric axioms]
2. $\langle u + v, w \rangle = \langle u, w \rangle + \langle v, w \rangle$
3. $\langle ku, v \rangle = k \langle u, v \rangle$
4. $\langle v, v \rangle \geq 0$

where $\langle v, v \rangle = 0$

if and only if $v = 0$.

$$\langle u, v \rangle = u \cdot v = u_1v_1 + u_2v_2 + \cdots u_nv_n$$

Ex 01 Let $\langle u, v \rangle$ be the Euclidean inner product on R^2, and let $u = (3, -2)$ $v = (4, 5)$, $w = (-1, 6)$ and $k = -4$ Find

(a) $\langle u, v \rangle = \langle v, u \rangle$

L.H.S

$$\langle u, v \rangle = \langle (3, -2), (4, 5) \rangle$$
$$= (3)(4) + (-2)(5)$$
$$= 12 - 10$$
$$\boxed{\langle u, v \rangle = 2}$$