#flo #hw

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1 | **Inner product spaces!**

wait, we just got the definition of the dot product? in chapter 6??
we can generalize the dot product to get the **inner product**
the inner product is more fundemental than lenght, and can in fact lead to the concepts of len and angles
we denote this inner product with $\langle u, v \rangle$. now we get to the definition of the inner product:

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takes an inner product of two elements $\in V$ and goes to a number $\langle u,v \rangle \in F$
has the following properties:
**positivity**                     $\langle v, v \rangle \geq 0$ for all $v \in V$

**definiteness**                   $\langle v, v \rangle = 0$ iff $v = 0$

**additivity in first slot**       $\langle u+v, w \rangle = \langle u, w \rangle + \langle v, w \rang

**homogeneity in the first slot**  $\langle \lambda v, u \rangle = \lambda \langle v, u \rangle$ for al

**conjugate symmetry**             $\langle u, v \rangle = \overline{\langle v, u \rangle}$ for all $u
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since all real numbers equal their complex conjugate, we can just say that in real vector spaces $\langle u, v \rangle = \langle v, u \rangle$
now with the inner product, we can define an **inner product space** which is just a

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vector space along with an inner product
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V is an inner product space for the rest of the chapter
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the func that takes v to $\langle v, u \rangle$ is a linear map from V to F
each inner product also determines a norm, following the pattern $||v|| = \sqrt{\langle v, v \rangle}$
the norm is also also ~homogenous: $||\lambda v|| = |\lambda| \; ||v||$
we also get to define the concept of orthogonality:

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title: orthogonal
two vecs are othogonal if $\langle u, v \rangle = 0$
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