1. Vectors

1.2 The dot product

$u=(u_1,\dots,u_n)$,

$v=(v_1,\dots,v_n)$

$u\cdot v = u_1v_1 + u_2v_2 + \cdots + u_nv_n$.

Thm a) $v\cdot u = u\cdot v$

b. $u\cdot(v+w) = u\cdot v + u\cdot w$
(distributive law)

c. $(cu)\cdot v = c(u\cdot v)$

d. $u\cdot u \geq 0$ and $(u,u)=0$ iff

$u=0$

Def. $\|v\| = \sqrt{v\cdot v}$

Rem. $e_k = \begin{bmatrix} 0 \\ 0 \\ \vdots \\ 1 \\ \vdots \\ 0 \end{bmatrix} \leftarrow k\text{-th position}$