$$\|\vec{u}\| = \sqrt{\vec{u}\cdot\vec{u}} = \sqrt{u_1^2 + u_2^2 + \cdots + u_n^2}$$

$$d(u,v) = \|\vec{u}-\vec{v}\| = \sqrt{(u_1-v_1)^2 + (u_2-v_2)^2 + \cdots + (u_n-v_n)^2}$$

<u>THM 3</u> – $|\vec{u}\cdot\vec{v}| \le \|\vec{u}\|\|\vec{v}\|$

<u>THM 4</u> — $\|\vec{u}\| \ge 0$, $\|\vec{u}\| = 0 \iff \vec{u} = \vec{0}$, $\|k\vec{u}\| = |k|\|\vec{u}\|$,

$\|\vec{u}+\vec{v}\| \le \|\vec{u}\| + \|\vec{v}\|$ ← TRIANGLE INEQUALITY

<u>THM 5</u> – $d(u,v) \ge 0$, $d(u,v) = 0 \iff u = v$, $d(u,v) = d(v,u)$.

$d(u,v) \le d(u,w) + d(w,v)$ ← TRIANGLE INEQUALITY

<u>THM 6</u> – $\vec{u}\cdot\vec{v} = \frac{1}{4}\left(\|\vec{u}+\vec{v}\|\right)^2 - \frac{1}{4}\left(\|\vec{u}-\vec{v}\|\right)^2$

$\vec{u}$ AND $\vec{v}$ ARE SAID TO BE ORTHOGONAL (PERPENDICULAR)

$\iff \vec{u}\cdot\vec{v} = 0$.

<u>THM 7</u> – IF $\vec{u}\cdot\vec{v} = 0$, THEN $\|\vec{u}+\vec{v}\|^2 = \|\vec{u}\|^2 + \|\vec{v}\|^2$

IF $\vec{u}$ AND $\vec{v}$ ARE WRITTEN AS COLUMN MATRICES, THEN

$\vec{u}\bullet\vec{v} = \vec{v}^T\vec{u} = \vec{u}^T\vec{v}$. IF A IS AN $n \times n$ MATRIX, THEN

$(A\vec{u})\cdot\vec{v} = \vec{u}\cdot(A^T\vec{v})$ AND $\vec{u}\cdot(A\vec{v}) = (A^T\vec{u})\cdot\vec{v}$