THEOREM 2 – IF $\vec{U}$ AND $\vec{V}$ ARE VECTORS AND K IS A SCALAR

a) $\vec{U}\cdot\vec{V} = \vec{V}\cdot\vec{U}$ b) $\vec{U}\cdot(\vec{V}+\vec{W}) = \vec{U}\cdot\vec{V} + \vec{U}\cdot\vec{W}$

c) $k(\vec{U}\cdot\vec{V}) = (k\vec{U})\cdot\vec{V} = \vec{U}\cdot(k\vec{V})$

d) $\vec{V}\cdot\vec{V} > 0$ IF $\vec{V} \neq \vec{0}$ AND $\vec{V}\cdot\vec{V} = 0$ IF $\vec{V} = \vec{0}$

THEOREM 3 – IF $\vec{U}$ AND $\vec{A}$ ARE VECTORS WITH $\vec{A} \neq \vec{0}$, THEN

$$\text{PROJ}_{\vec{A}}\,\vec{U} = \frac{\vec{U}\cdot\vec{A}}{\|A\|^2}\,\vec{A}$$ (VECTOR COMPONENT OF $\vec{U}$ ALONG $\vec{A}$)

$$\vec{U} - \text{PROJ}_{\vec{A}}\,\vec{U}$$ (VECTOR COMPONENT OF $\vec{U}$ ORTHOGONAL TO $\vec{A}$)

NOTE: $$\|\text{PROJ}_{\vec{A}}\,\vec{U}\| = \frac{|\vec{U}\cdot\vec{A}|}{\|\vec{A}\|} = \|\vec{U}\|\,|\cos\theta|$$ ANGLE BETWEEN $\vec{A}$ AND $\vec{U}$.

THE DISTANCE BETWEEN THE POINT $P_0 = (x_0, y_0)$ AND THE LINE

$Ax + By + C = 0$ IS

$$\frac{|Ax_0 + By_0 + C|}{\sqrt{A^2+B^2}}$$