1 | definitions

1.1 | geometric

$$\vec{A} \cdot \vec{B} \triangleq |\vec{A}||\vec{B}| \cos\theta$$

1.2 | algebraic

2 | results (from the geometric definition)

2.1 | distribution: $(\vec{a} + \vec{b}) \cdot \vec{c} = \vec{a} \cdot \vec{c} + \vec{b} \cdot \vec{c}$

Let θ equal the angle between $\vec{a} + \vec{b}$ and $\vec{c}$. Let γ equal the angle between $\vec{a}$ and $\vec{b}$.

$$\begin{aligned}
(\vec{a} + \vec{b}) \cdot \vec{c} &= |\vec{a} + \vec{b}||c| \cos\theta \\
&= \sqrt{|\vec{a}|^2 + |\vec{b}|^2 - 2|\vec{a}||\vec{b}| \cos\gamma}|c| \cos\theta \\
&= \sqrt{|\vec{c}|^2|\vec{a}|^2 + |\vec{c}|^2|\vec{b}|^2 - 2|\vec{c}|^2|\vec{a}||\vec{b}| \cos\gamma} \cos\theta
\end{aligned}$$