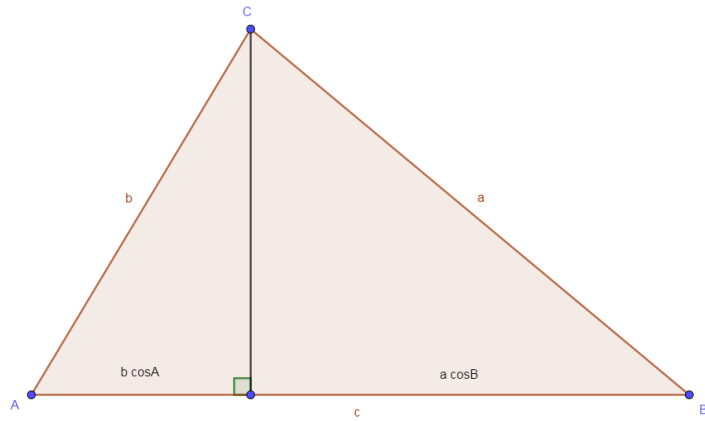


(1)

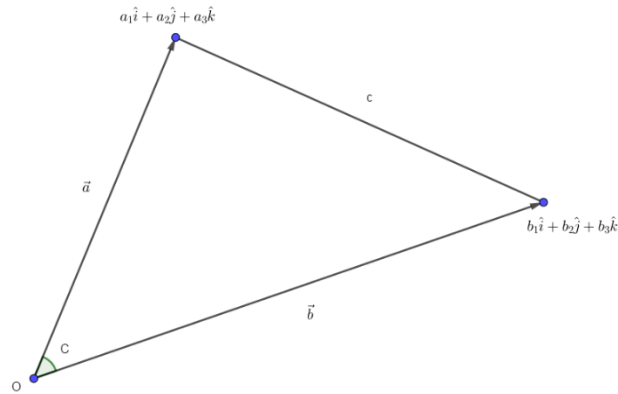


$$\begin{aligned}a &= b \cos C + c \cos B & a^2 &= ab \cos C + ac \cos B \\b &= a \cos C + c \cos A & b^2 &= ab \cos C + bc \cos A \\c &= a \cos B + b \cos A & c^2 &= ac \cos B + bc \cos A\end{aligned}$$

$$a^2 + b^2 - c^2 = 2ab \cos C$$

$$\therefore \cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

(2)



$$a = |\vec{a}| \quad b = |\vec{b}| \quad c = |\vec{a} - \vec{b}|$$

$$\begin{aligned} \vec{a} \cdot \vec{b} &= |\vec{a}| |\vec{b}| \cos C = ab \cos C = ab \frac{a^2 + b^2 - c^2}{2ab} = \frac{1}{2}(a^2 + b^2 - c^2) \\ &= \frac{1}{2} \left(a_1^2 + a_2^2 + a_3^2 + b_1^2 + b_2^2 + b_3^2 - ((a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2) \right) \\ &= \frac{1}{2} \left(a_1^2 + a_2^2 + a_3^2 + b_1^2 + b_2^2 + b_3^2 \right. \\ &\quad \left. - (a_1^2 - 2a_1b_1 + b_1^2 + a_2^2 - 2a_2b_2 + b_2^2 + a_3^2 - 2a_3b_3 + b_3^2) \right) \\ &= \frac{1}{2} (2a_1b_1 + 2a_2b_2 + 2a_3b_3) = a_1b_1 + a_2b_2 + a_3b_3 \end{aligned}$$

$$\therefore \vec{a} \cdot \vec{b} = a_1b_1 + a_2b_2 + a_3b_3$$



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