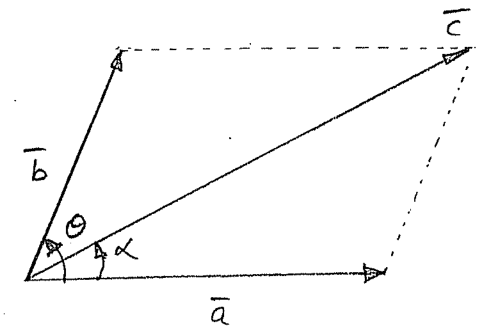
Ex.: Scalar Multiplication is Distributive w.r.t the Sum



P2] Prove : $K(\bar{a}+\bar{b}) = K\cdot\bar{a} + K\cdot\bar{b}$

Let $\bar{c} = \bar{a}+\bar{b}$ as shown in Fig.

$$\|\bar{c}\| = \sqrt{(a+b\cos\theta)^2 + b^2\sin^2\theta}$$

$$\alpha = \tan^{-1}\frac{b\sin\theta}{a+b\cos\theta}$$

$$\|K\cdot(\bar{a}+\bar{b})\| = |k|\cdot\sqrt{(a+b\cos\theta)^2 + b^2\sin^2\theta}$$

α remains same. ($\because$ K is scalar)

Let $\bar{d} = K\cdot\bar{a} + K\cdot\bar{b}$

$$\|\bar{d}\| = \sqrt{(Ka+Kb\cos\theta)^2 + k^2b^2\sin^2\theta}$$

$$= |K|\sqrt{(a+b\cos\theta)^2 + b^2\sin^2\theta}$$

$$\alpha_d = \tan^{-1}\frac{Kb\sin\theta}{Ka+Kb\cos\theta} = \tan^{-1}\frac{b\sin\theta}{a+b\cos\theta}$$

$\therefore$ We have

$$\left.\begin{aligned} \|k\cdot(\bar{a}+\bar{b})\| &= \|d\| \\ \alpha &= \alpha_d \end{aligned}\right\}$$ Both vectors have same magnitude & direction

$\therefore$ $K(\bar{a}+\bar{b}) = K\cdot\bar{a} + K\cdot\bar{b}$ proved.