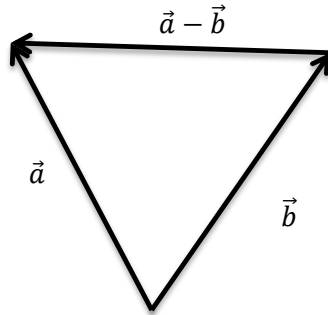


if  $\hat{a}$  and  $\hat{b}$  are unit vectors at an angle  $\theta$  show that  $|\hat{a}-\hat{b}|=2\sin(\theta/2)$

$\vec{a}$  and  $\vec{b}$  - are unit vectors

$\theta$  - the angle between them



Law of cosines:

$$|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2|\vec{a}||\vec{b}| \cos \theta,$$

$\vec{a}, \vec{b}$  - some vectors,  $\theta$  - the angle between them

$\vec{a}$  and  $\vec{b}$  - are unit vectors, therefore  $|\vec{a}| = |\vec{b}| = 1$

Law of cosines:

$$|\vec{a} - \vec{b}|^2 = 1 + 1 - 2 \cos \theta = 2(1 - \cos \theta) = \left| \sqrt{\frac{1 - \cos \theta}{2}} = \sin \frac{\theta}{2} \right| = 4 \sin^2 \frac{\theta}{2}$$

Or:

$$|\vec{a} - \vec{b}| = 2 \sin \frac{\theta}{2}$$