Movimiento circular y aceleración

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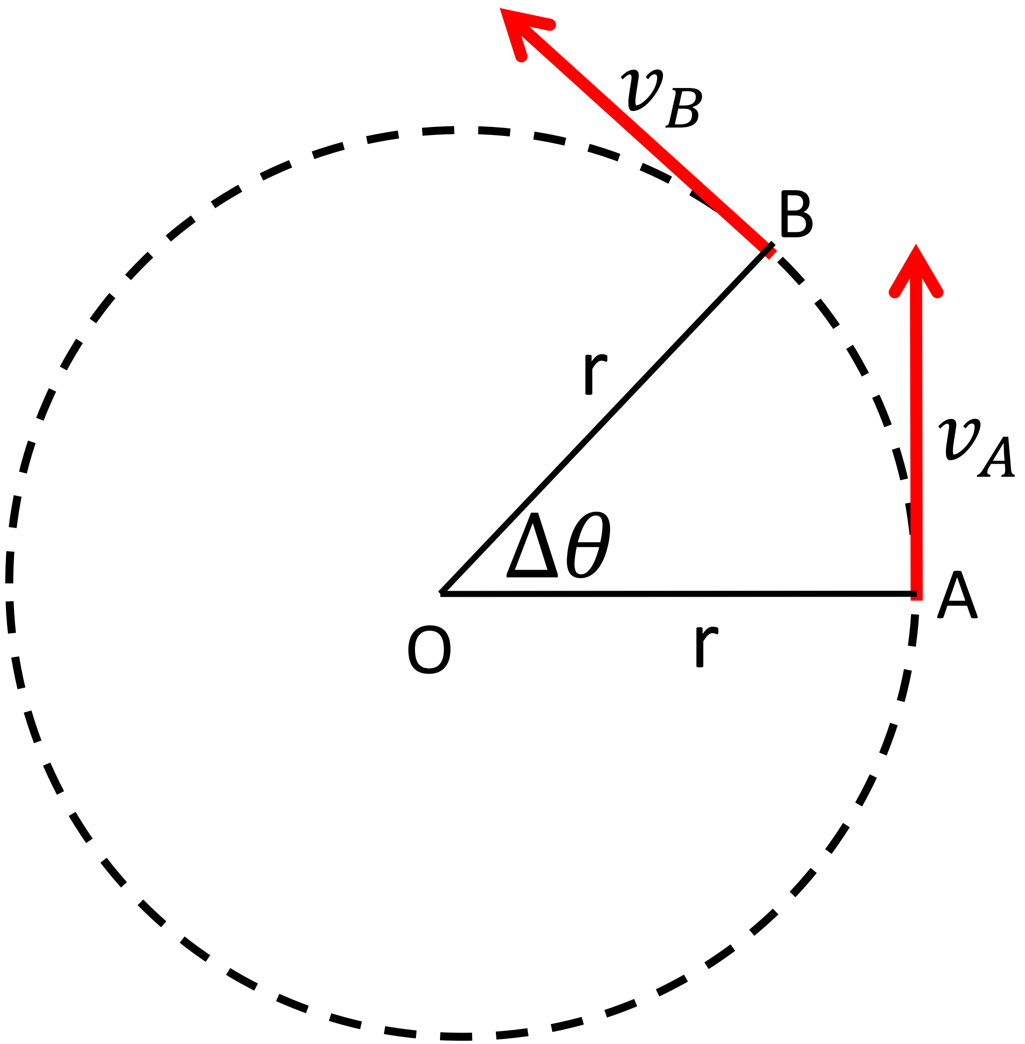
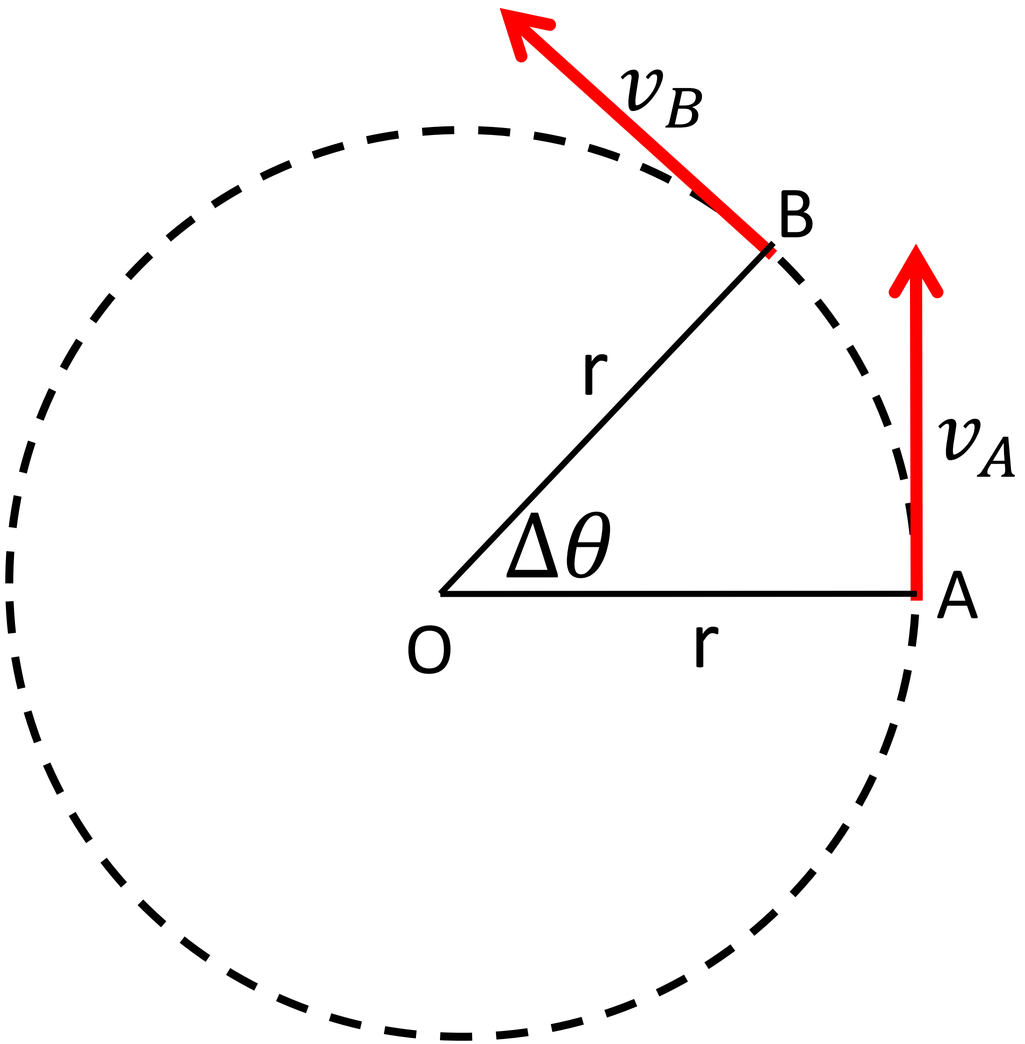


Si la aceleración ($\vec{a}$) es una magnitud **vectorial** igual a la tasa de cambio de la velocidad ($\Delta\vec{v}$):

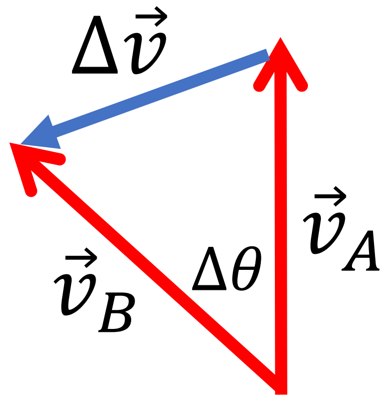
$$\vec{a} = \frac{\Delta\vec{v}}{\Delta t}$$

Y en el movimiento circular uniforme, **el módulo de la velocidad permanece constante**, entonces

¿Existirá aceleración?

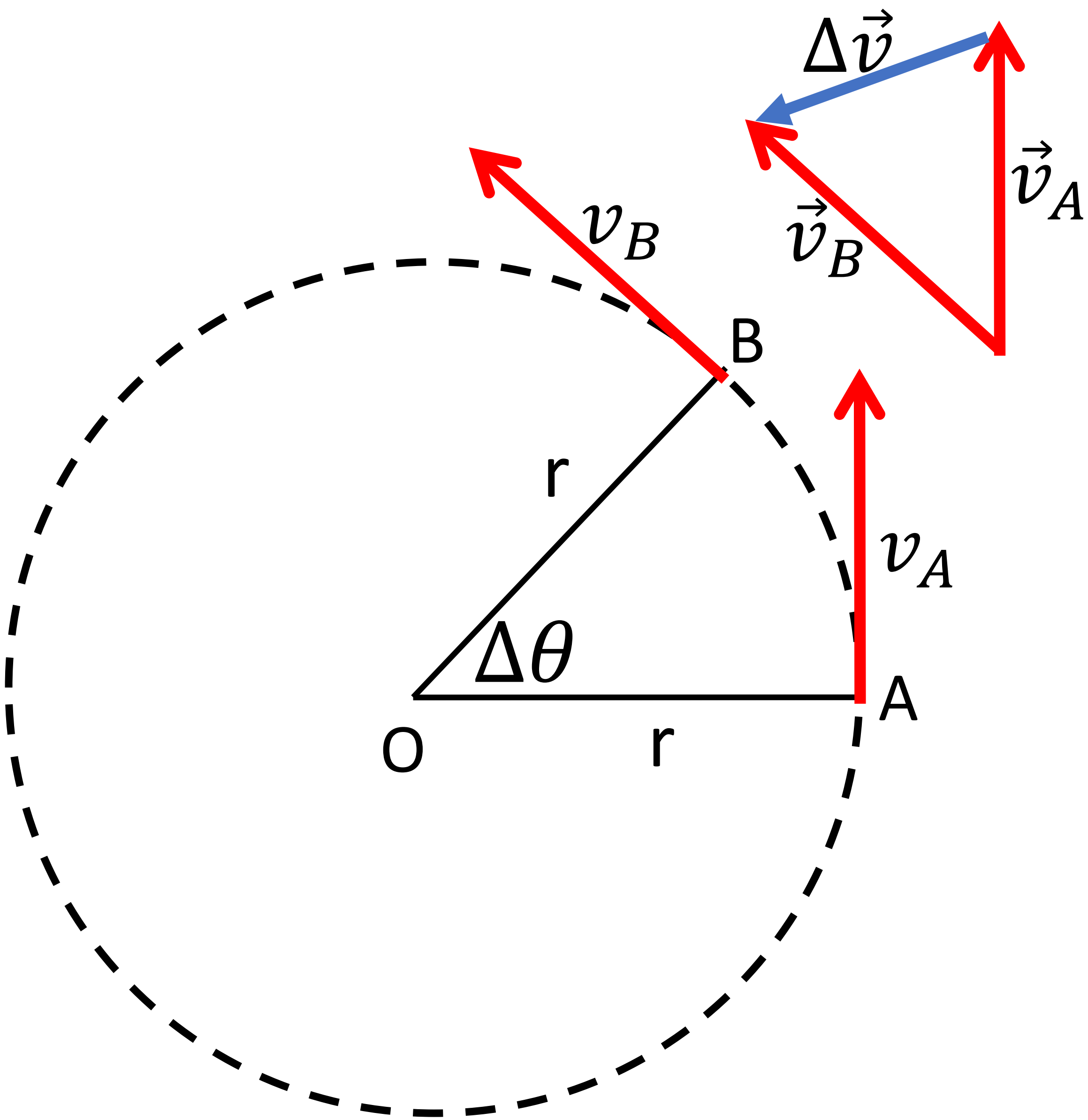


$$\Delta\vec{v} = \vec{v}_B\text{-}\vec{v}_A$$



$$\frac{\Delta v}{\sin(\Delta\theta\ )} = \frac{v_A}{\sin\measuredangle(\frac{\pi}{2} - \frac{\Delta\theta}{2})}$$

Si $\Delta t \to 0$, entonces



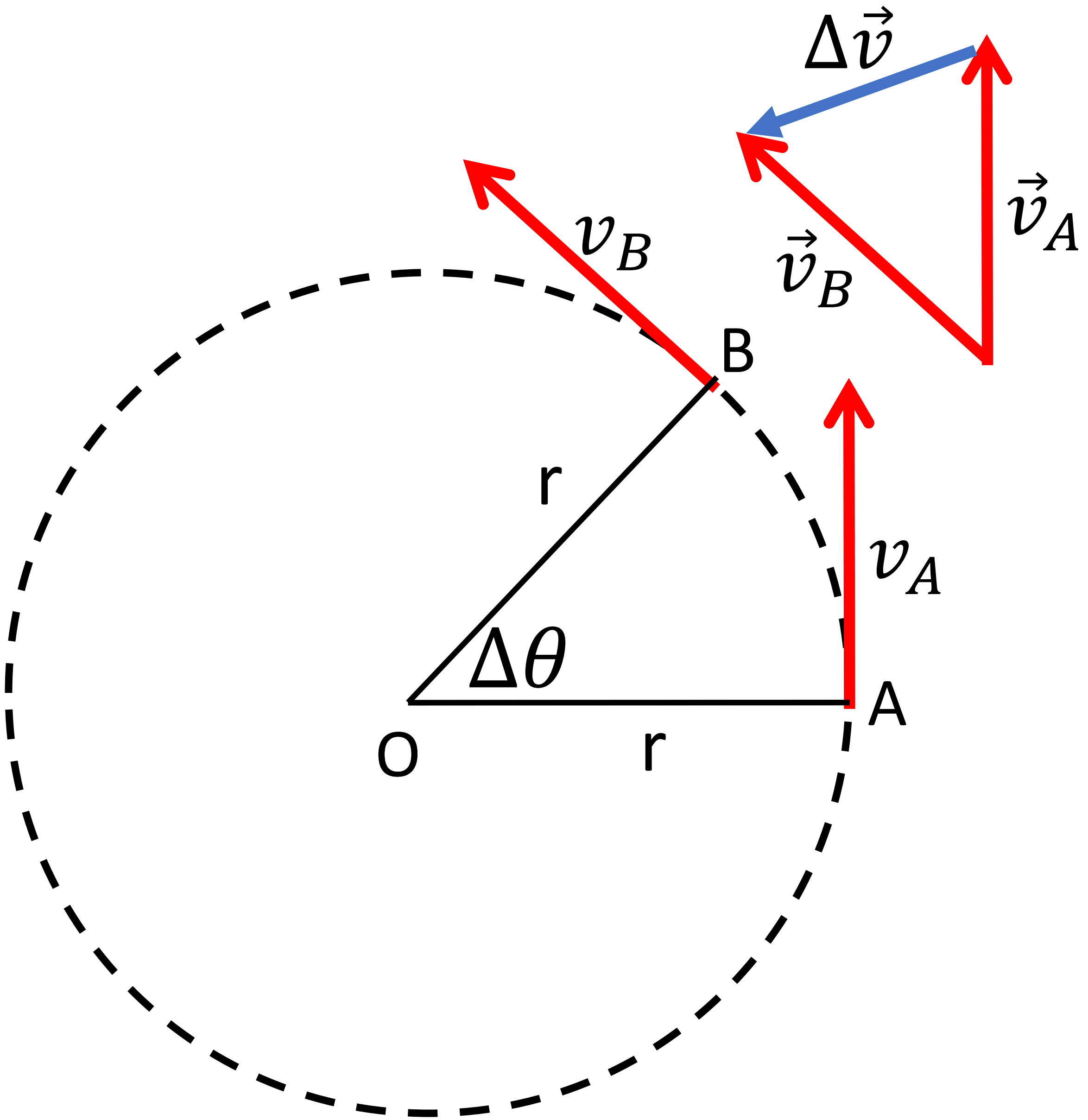
$\Delta\theta \to 0$ y

$$\sin(\Delta\theta) \approx \Delta\theta$$

$$\sin\measuredangle\left(\frac{\pi}{2} - \frac{\Delta\theta}{2}\right) \approx 1$$

$$\frac{\Delta v}{\sin(\Delta\theta)} = \frac{v_A}{\sin\measuredangle\left(\frac{\pi}{2} - \frac{\Delta\theta}{2}\right)}$$

$$\frac{\Delta v}{\Delta\theta} = \frac{v}{1}$$



$$\frac{\Delta v}{\Delta \theta} = \frac{v}{1}$$

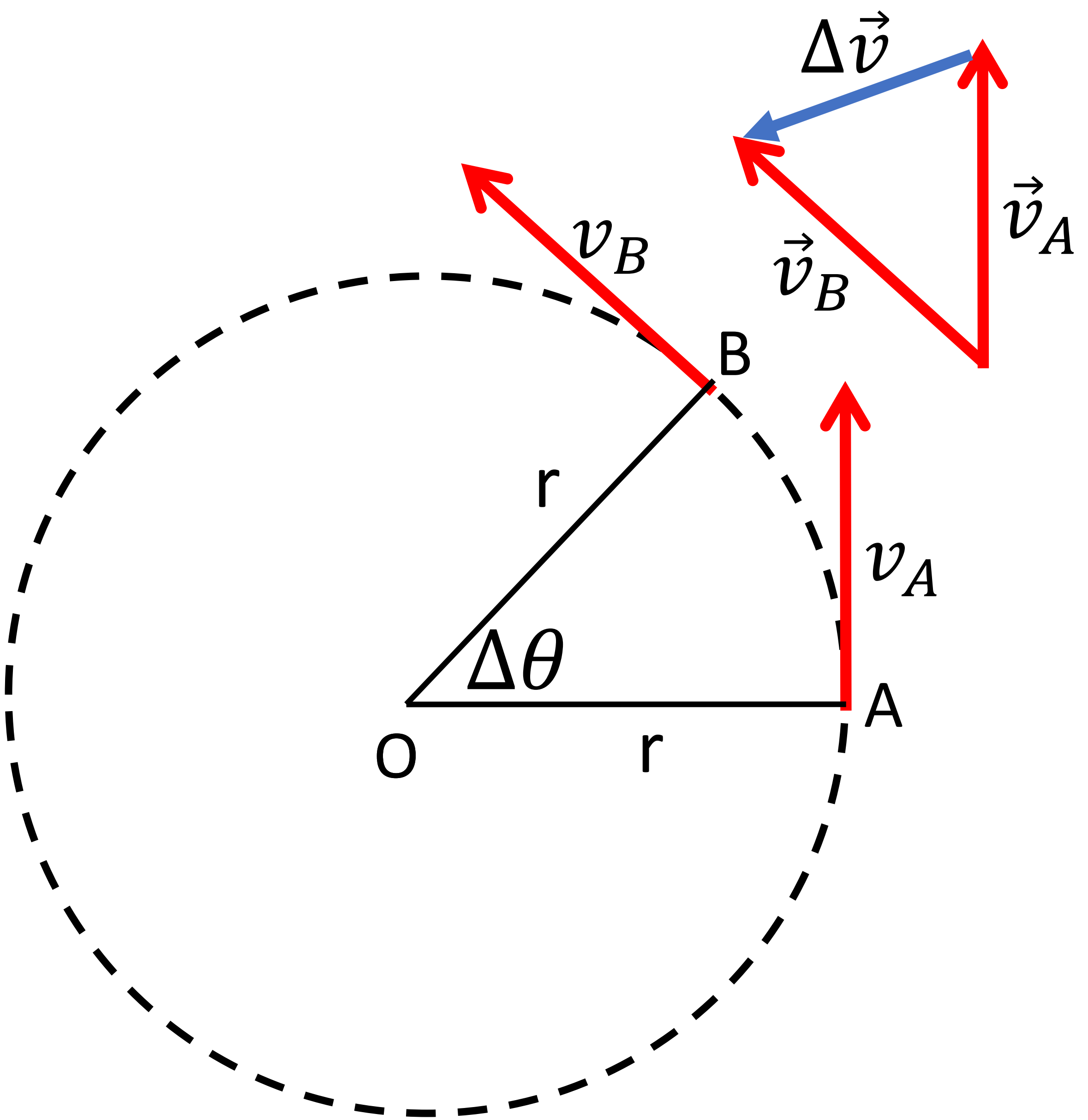
$$\frac{\Delta v}{\Delta \theta} = v$$

$$\Delta v = v \cdot \Delta \theta$$

$$\Delta L = \Delta \theta \cdot r \rightarrow \quad \Delta \theta = \frac{\Delta L}{r}$$

$$v = \frac{\Delta L}{\Delta t} \rightarrow \quad \Delta L = v \cdot \Delta t$$

$$\Delta v = v \cdot \frac{\Delta L}{r} = v \cdot \frac{v \cdot \Delta t}{r}$$

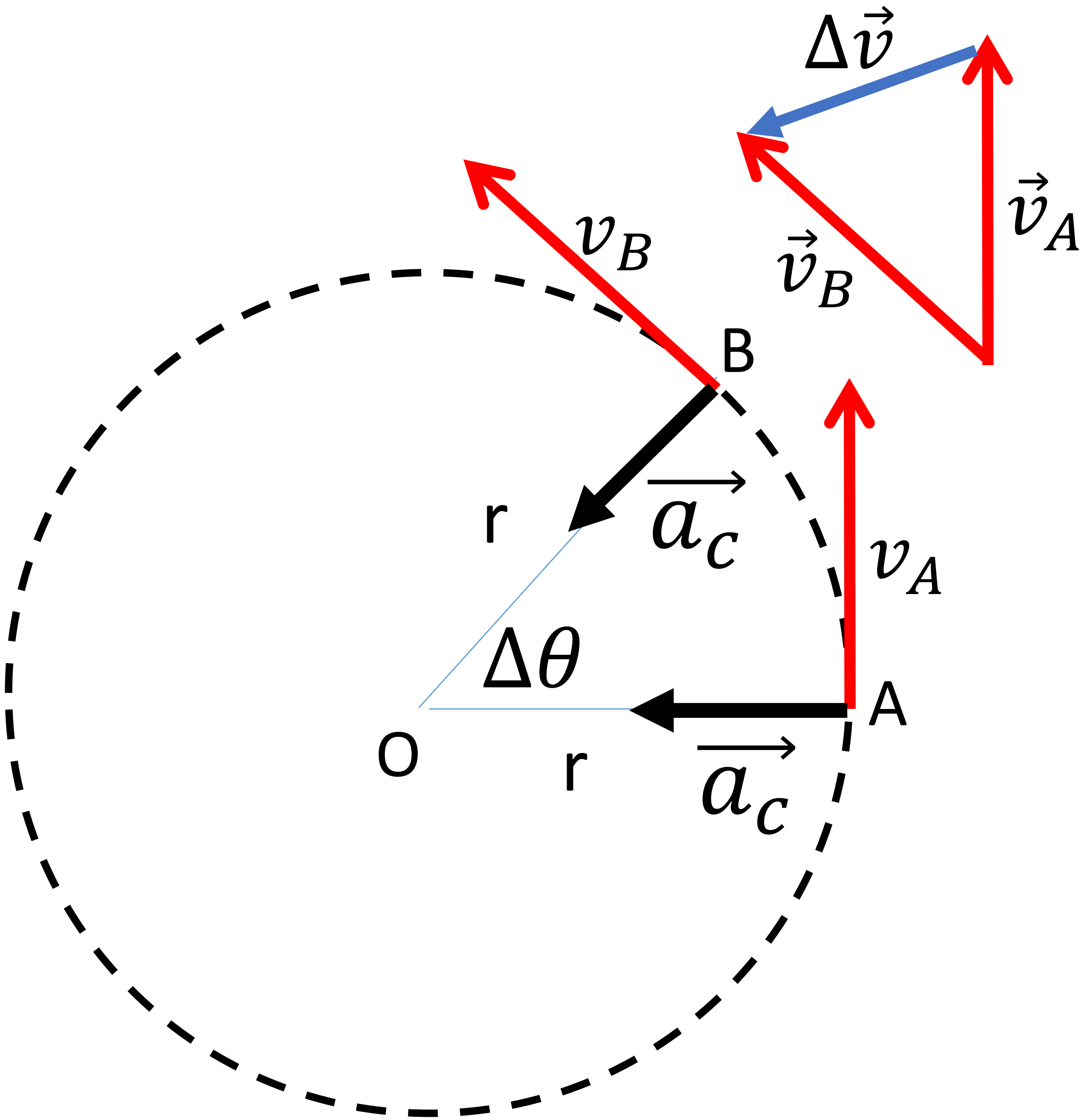


$$\Delta v = v \cdot \frac{\Delta s}{r} = v \cdot \frac{v \cdot \Delta t}{r}$$

$$\Delta v = \frac{v^2 \cdot \Delta t}{r}$$

$$\frac{\Delta v}{\Delta t} = \frac{v^2}{r}$$

$$a_c = \frac{v^2}{r}$$



$$a_c = \frac{v^2}{r}$$

El vector aceleración centrípeta es perpendicular a la velocidad y va dirigido hacia el centro de la trayectoria circular