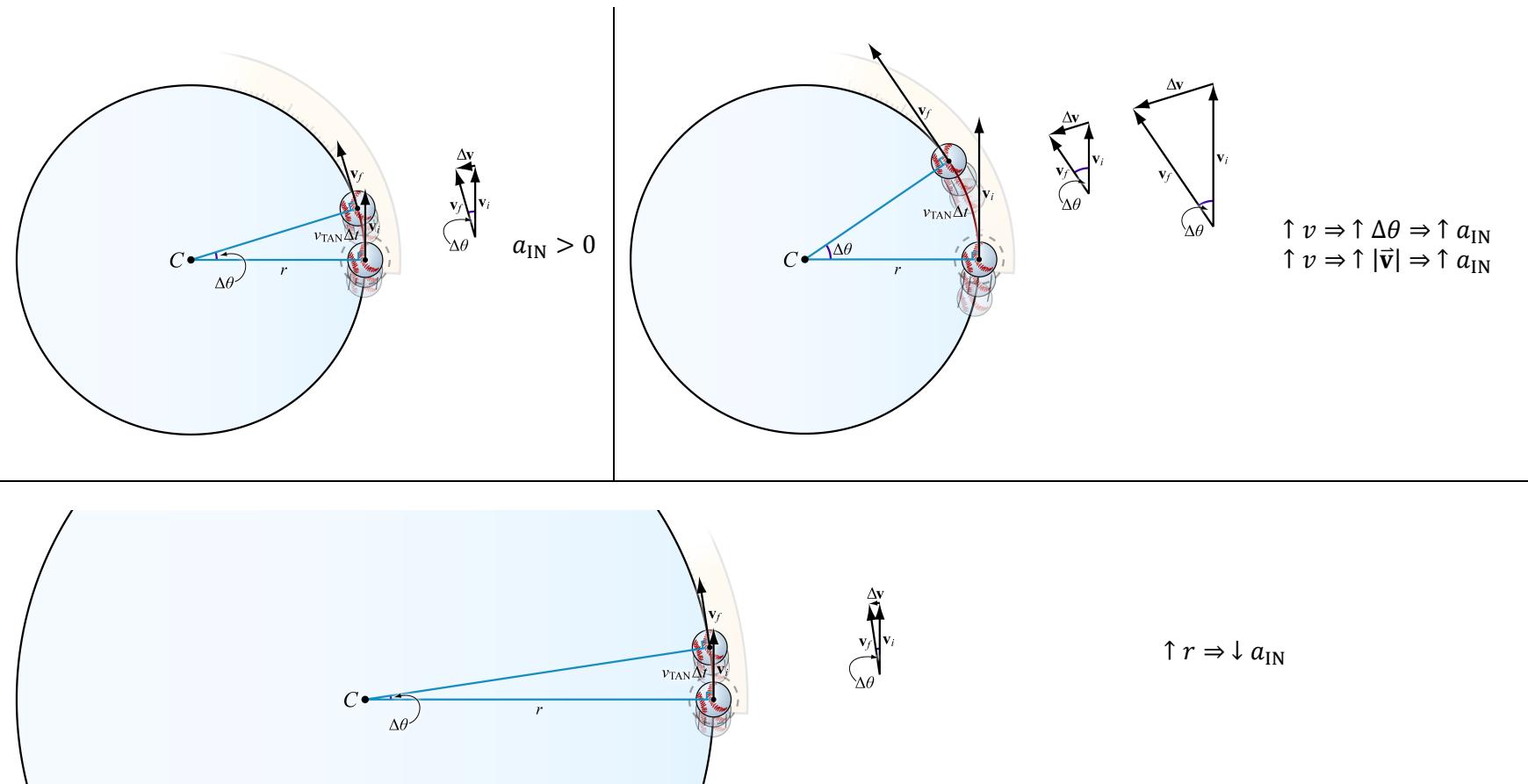


Uniform circular motion: Magnitude of centripetal acceleration

Intuition

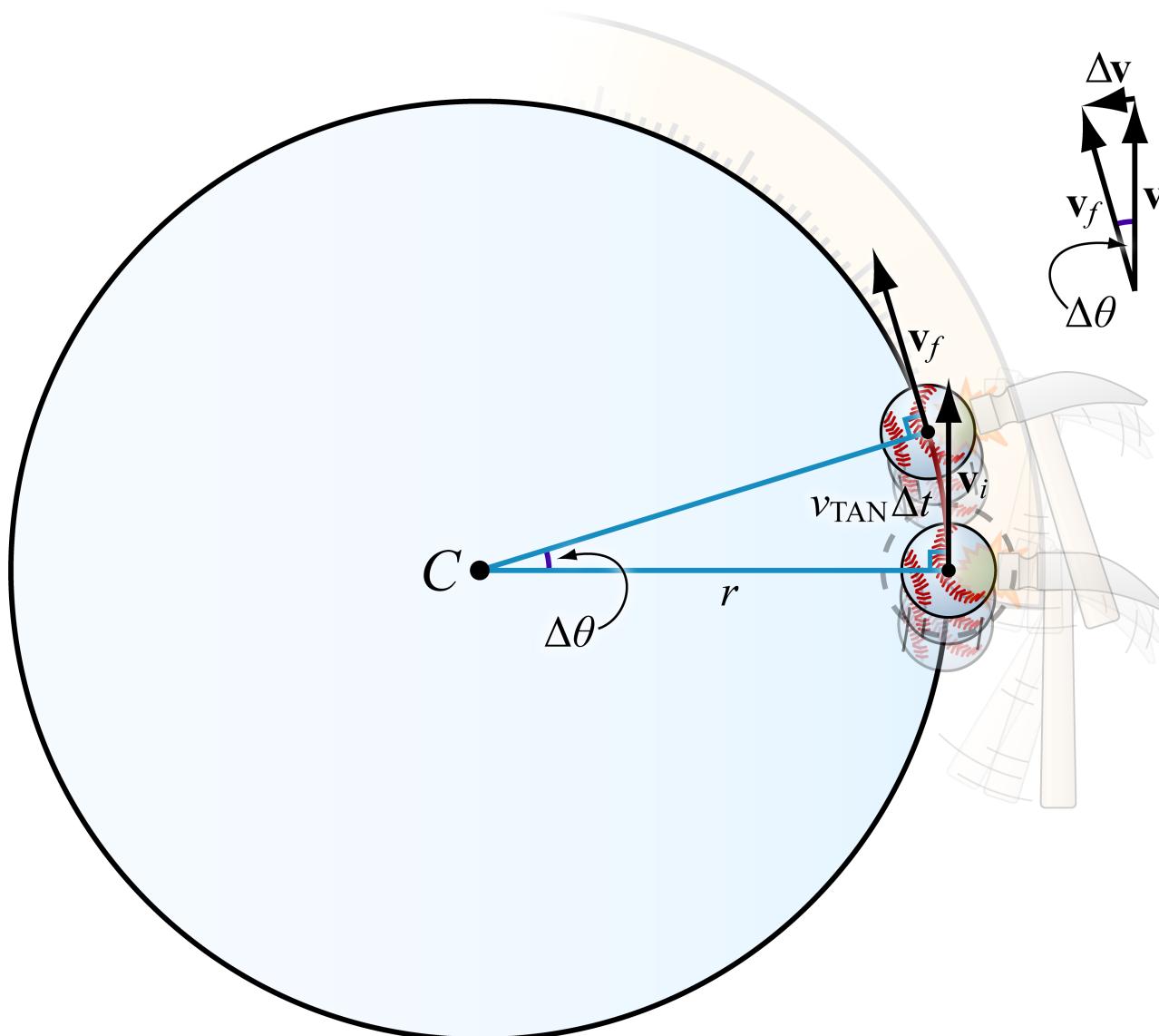
What kinematic factors can affect the magnitude of the inward acceleration of an object undergoing uniform circular motion?



$$a_{IN} = \frac{v_{TAN}^2}{r}$$

Uniform circular motion: Magnitude of centripetal acceleration

Symbolic derivation



Consider very small $\Delta \vec{v}$ and very small Δt

$$\frac{|\Delta \vec{v}|}{v_{TAN}} \approx \frac{v_{TAN} \Delta t}{r}$$

$$\frac{|\Delta \vec{v}|}{\Delta t} \approx \frac{v_{TAN}^2}{r}$$

$$a_{IN} = \lim_{\Delta t \rightarrow 0} \left| \frac{\Delta \vec{v}}{\Delta t} \right|$$

$$= \lim_{\Delta t \rightarrow 0} \frac{|\Delta \vec{v}|}{\Delta t}$$

$$a_{IN} = \frac{v_{TAN}^2}{r}$$