Cirkulär centralrörelse

Vi betraktar en bil som kör runt i en rondell. Även om farten är konstant är inte den vektoriella hastigheten konstant eftersom den hela tiden ändrar riktning. Den vektoriella hastighetsändringen i varje tidsögonblick ger upphov till en inåtriktad radiell kraft som kallas centripetalkraft.

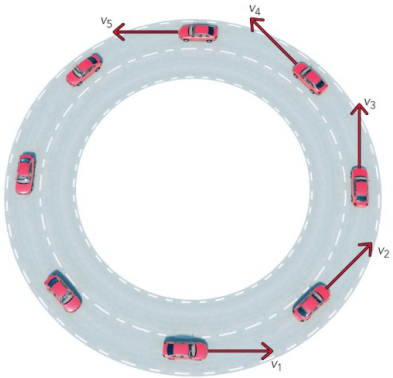


Fig 1

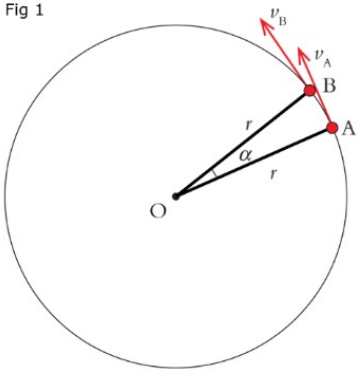


Fig 2

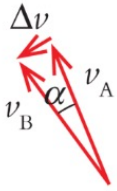
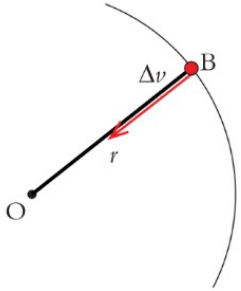
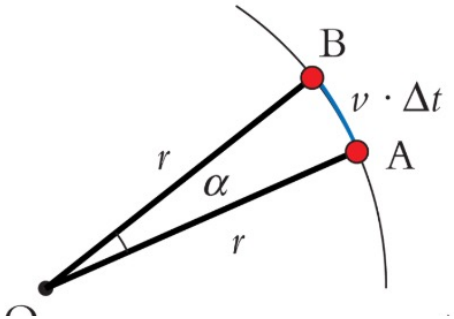
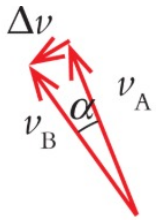


Fig 3



Centripetalaccelleration och -kraft





Konstant fart => $v_A = v_B = v$

Likformiga trianglar => $\frac{v \cdot \Delta t}{r} = \frac{\Delta v}{v}$ => Accellerationen $a = \frac{\Delta v}{\Delta t} = \frac{v^2}{r}$

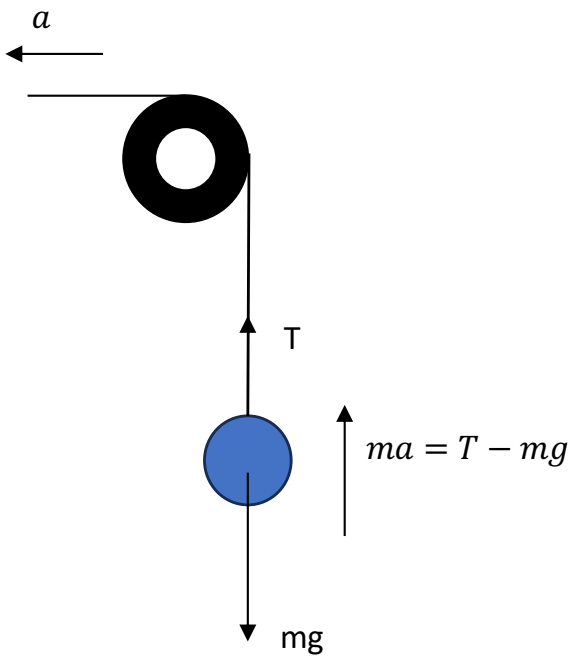
Vinkelhastigheten $\omega = \frac{\Delta \alpha}{\Delta t} = \frac{2\pi}{T} = 2\pi f$ Vinkelhastigheten $\omega = \frac{\Delta s}{\Delta t} \cdot \frac{1}{r} = \frac{v}{r}$

$$a = \frac{v^2}{r} = \omega^2 \cdot r$$

$$F_c = m \cdot a = m \cdot \frac{v^2}{r} = m \cdot \omega^2 \cdot r$$

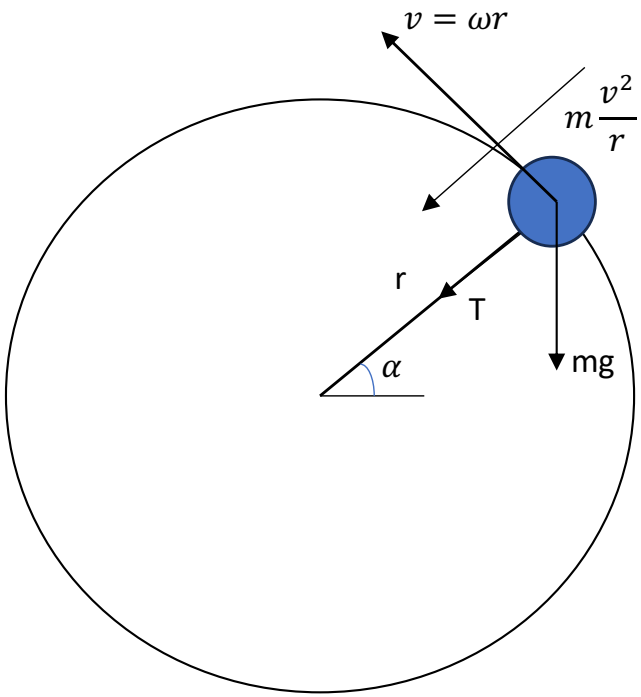
Jämförelse med det linjära fallet

Linjär rörelse



$$T = m(a - g)$$

Cirkulär rörelse



$$T = m(\frac{v^2}{r} - g \cdot \sin(\alpha))$$

*) Notera att linkraften blir större i den nedre positionen $(\sin(-90°) = -1)$än i den övre positionen $(\sin(90°) = +1)$