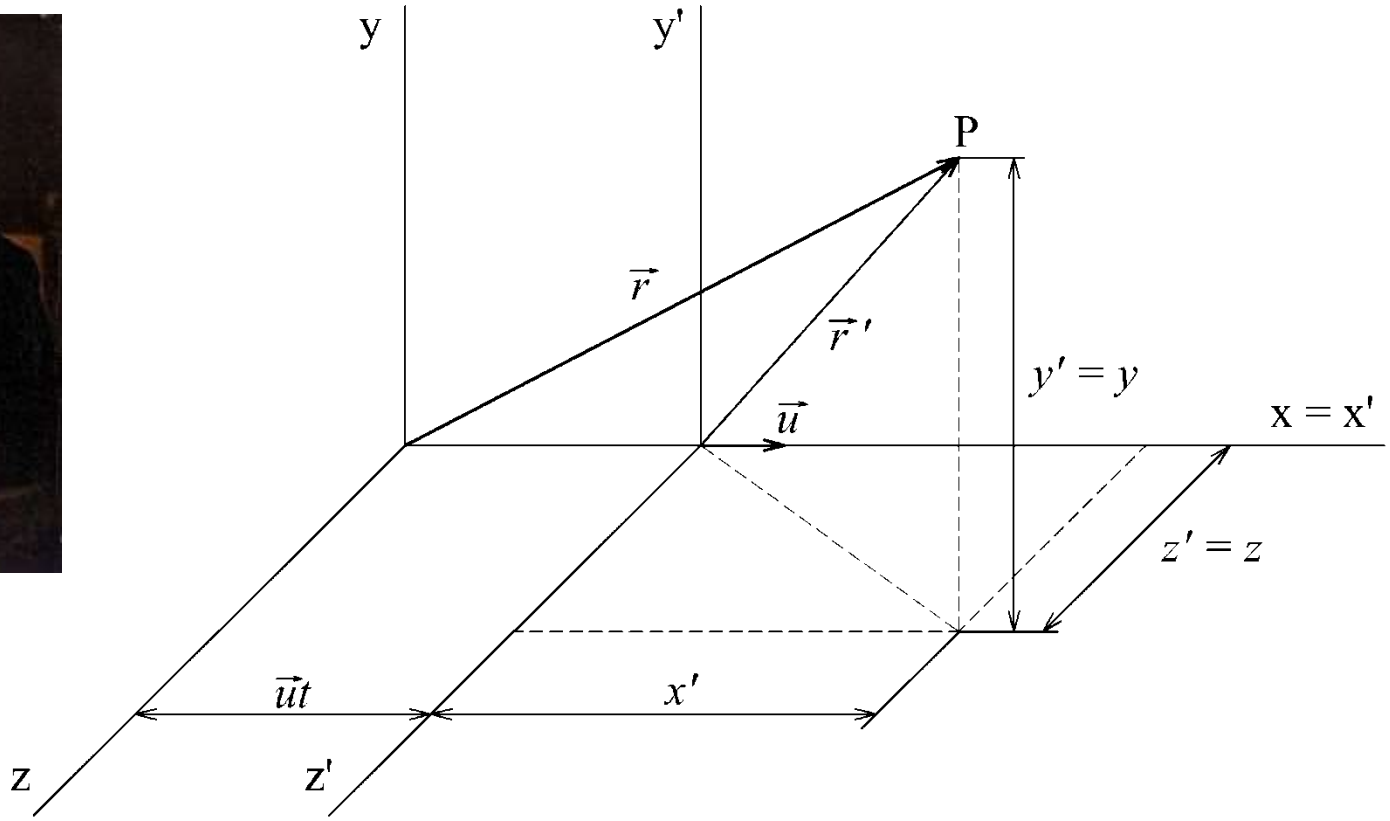
Dynamika

Galileova transformace



Zákon setrvačnosti

ISS

Zákon síly

2. Newtonův pohybový zákon

$\vec{F} = m\vec{a}$ $\quad v \ll c$ $\quad m \neq m(t)$ $\quad \vec{F} = \dfrac{d\vec{p}}{dt}$

hybnost $\vec{p} = m\vec{v}$

$$\vec{F} = m\frac{d^2\vec{r}}{dt^2}$$

$$\vec{F} = m\vec{a} = m\frac{d\vec{v}}{dt} = \frac{d}{dt}(m\vec{v}) = \frac{d\vec{p}}{dt}$$

Pohybová rovnice

impulz síly $\vec{I} = \int_{t_1}^{t_2} \vec{F}dt$

$$\vec{I} = \int_{t_1}^{t_2} \vec{F}dt = \int_{t_1}^{t_2} \frac{d\vec{p}}{dt}dt = \int_{\vec{p}_1}^{\vec{p}_2} d\vec{p} = \vec{p}_2 - \vec{p}_1 = m\vec{v}_2 - m\vec{v}_1$$

Zákon akce a reakce

$$\vec{F}_{12} = -\vec{F}_{21}$$

$$\vec{F}_{12} = \frac{d\,\vec{p}_1}{dt} \qquad \vec{F}_{21} = \frac{d\,\vec{p}_2}{dt}$$

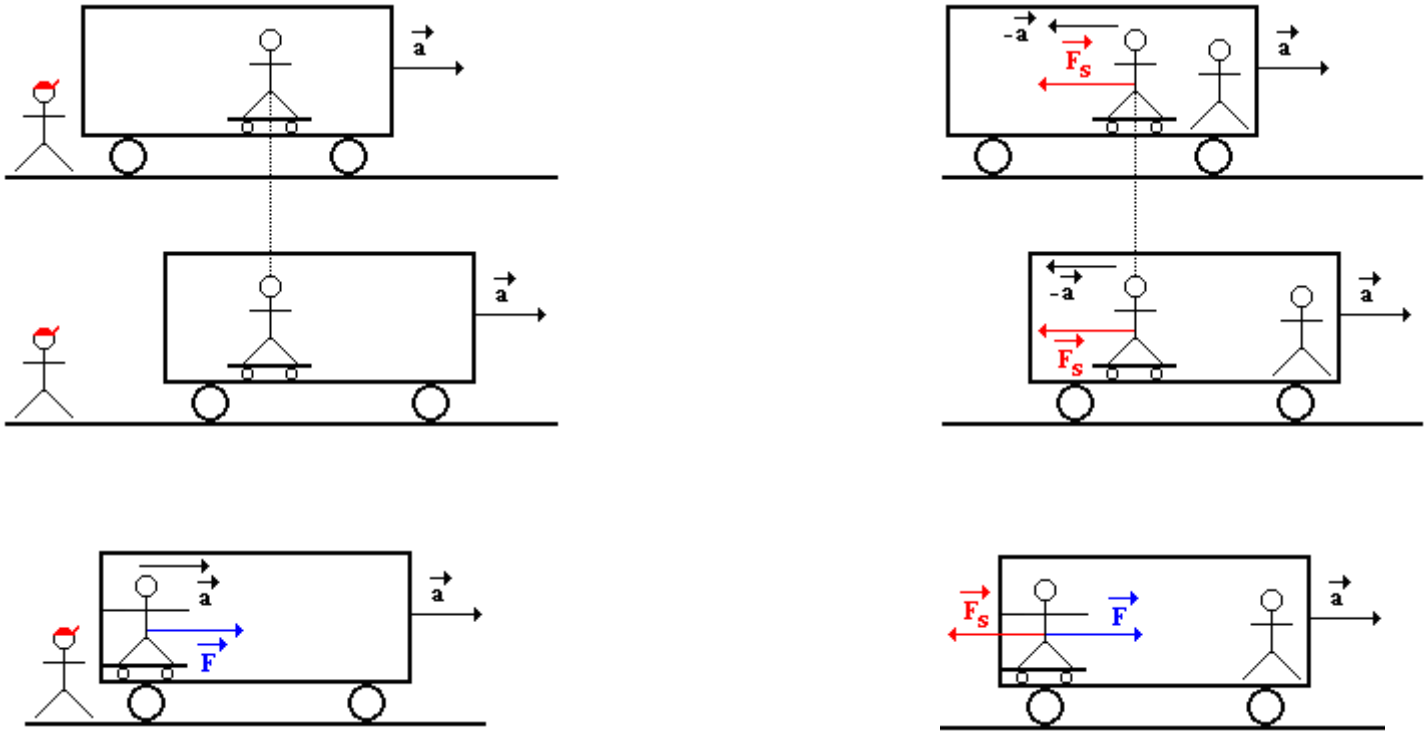
$$0 = \frac{d\,\vec{p}_1}{dt} + \frac{d\,\vec{p}_2}{dt} = \frac{d}{dt}\left(\vec{p}_1 + \vec{p}_2\right)$$

$$\vec{p}_1 + \vec{p}_2 = \overrightarrow{\text{konst}}$$

zákon zachování hybnosti (ZZH)

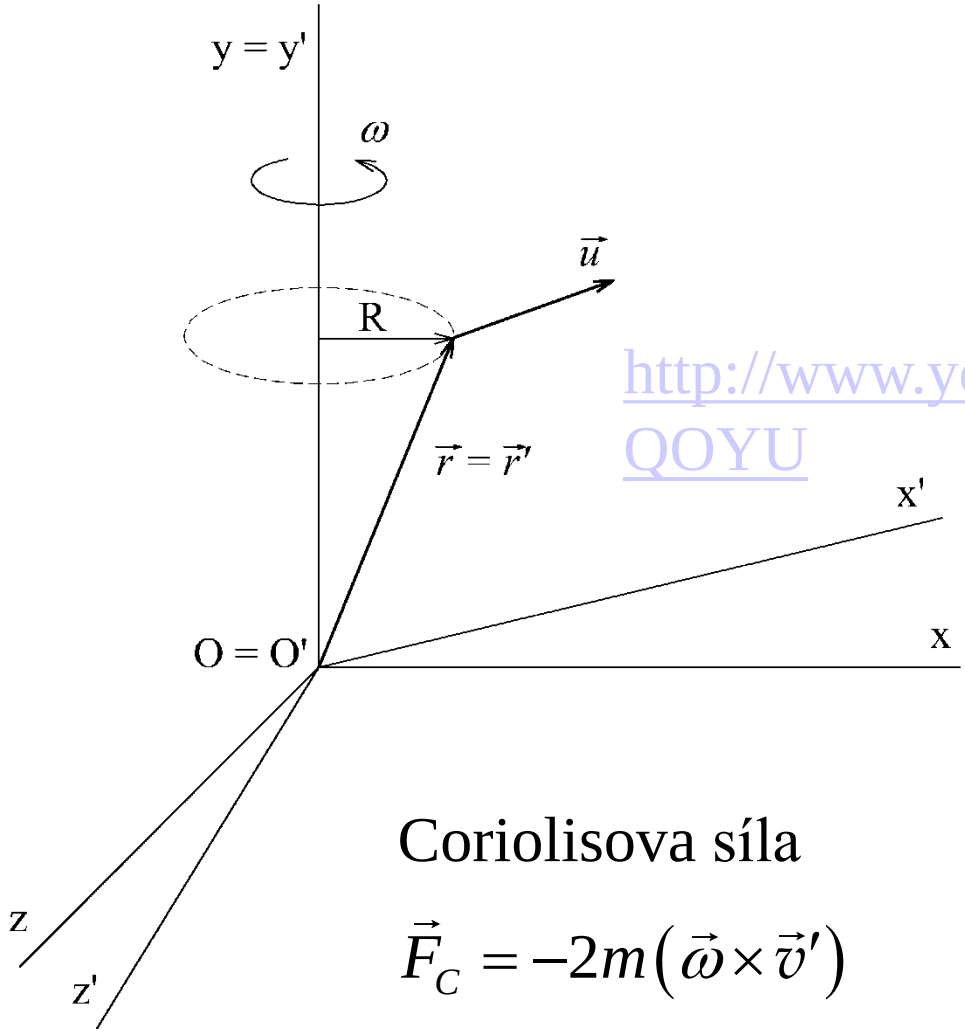
http://physics.fme.vutbr.cz/ufi.php?Action=0&Id=83

Neinerciální souřadnicová soustava



http://fyzika.jreichl.com/main.article/view/40-neinercialni-vztazne-soustavy

Neinerciální souřadnicová soustava



$$\vec{r} = \vec{r}'\,(t=0)$$

$$\vec{v} = \vec{v}' + \vec{u}$$

$$\vec{u} = \vec{\omega} \times \vec{r}$$

http://www.youtube.com/watch?v=mcPs_OdQOYU

$$\vec{F}' = m\vec{a}' = m\vec{a} + \vec{F}^{*} + \vec{F}_C + \vec{F}_o$$

Coriolisova síla

$$\vec{F}_C = -2m\left(\vec{\omega} \times \vec{v}'\right)$$

$$\vec{F}_o = -m\left[\vec{\omega} \times \left(\vec{\omega} \times \vec{r}'\right)\right]$$

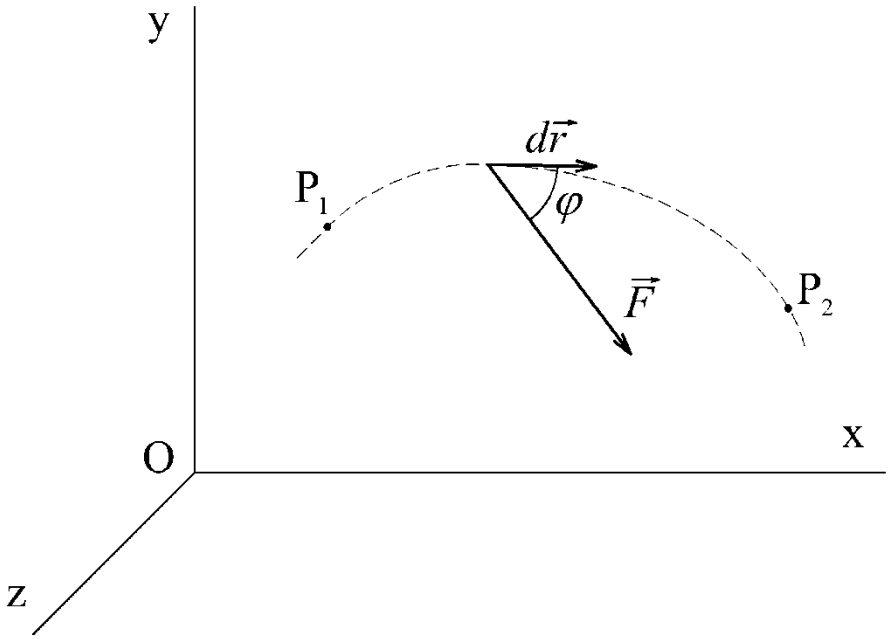
$$\vec{F}' = \vec{F} + \vec{F}_s$$

http://cs.wikipedia.org/wiki/Soubor:Low_pressure_system_over_Iceland.jpg

Práce a energie

$$dA = \vec{F} \cdot d\vec{r}$$

$$A = \int_{P_1}^{P_2} \vec{F} \cdot d\vec{r} = \int_{P_1}^{P_2} F\, dr \cos\varphi$$



$$A = \int_{P_1}^{P_2} \vec{F} \cdot d\vec{r} = m\int_{P_1}^{P_2} \frac{d\vec{v}}{dt} \cdot d\vec{r} = m\int_{P_1}^{P_2} \left[\left(\frac{d\vec{v}}{dt}\right)_t + \left(\frac{d\vec{v}}{dt}\right)_n \right] \cdot d\vec{r} = m\int_{P_1}^{P_2} \left(\frac{d\vec{v}}{dt}\right)_t \cdot d\vec{r}$$

$$= m\int_{P_1}^{P_2} \left(\frac{dv}{dt}\right) dr = m\int_{t_1}^{t_2} \left(\frac{dv}{dt}\right)\frac{dr}{dt}\, dt = m\int_{t_1}^{t_2} \left(\frac{dv}{dt}\right) v\, dt = m\int_{v_1}^{v_2} v\, dv$$

$$A = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2$$

kinetická energie $W_k = \frac{1}{2}mv^2$

Zákon zachování mechanické energie

$$A = \int_{P_1}^{P_2} \vec{F} \cdot d\vec{r} = -\Delta W_p = \Delta W_k$$

$$\Delta W_k + \Delta W_p = \Delta\left(W_k + W_p\right) = 0$$

$$W_k + W_p = \text{konst}$$

Výkon

$$P = \frac{dA}{dt}$$ okamžitý výkon

$$A = \int_{t_1}^{t_2} P\,dt$$

$$P = \frac{dA}{dt} = \vec{F} \cdot \frac{d\vec{r}}{dt} = \vec{F} \cdot \vec{v}$$

$$\eta = \frac{P_V}{P_P}$$ účinnost