

Formelark FYS-MEK 1110

$$\Sigma \vec{F} = m\vec{a} = \frac{d\vec{p}}{dt}, \quad \text{hvor} \quad \vec{p} = m\vec{v} = m \frac{d\vec{r}}{dt} \quad \text{og} \quad \vec{a} = \frac{d\vec{v}}{dt} = \frac{d^2\vec{r}}{dt^2}$$

$$\text{Konstant } \vec{a}: \quad \vec{v} = \vec{v}_0 + \vec{a}t, \quad \vec{r} = \vec{r}_0 + \vec{v}_0t + \frac{1}{2}\vec{a}t^2, \quad v^2 - v_0^2 = 2\vec{a} \cdot (\vec{r} - \vec{r}_0)$$

$$\text{Konstant } \alpha: \quad \omega = \omega_0 + \alpha t, \quad \theta = \theta_0 + \omega_0t + \frac{1}{2}\alpha t^2, \quad \omega^2 - \omega_0^2 = 2\alpha(\theta - \theta_0)$$

$$\text{Baneakselerasjon:} \quad \vec{a} = \frac{d\vec{v}}{dt} \hat{u}_T + \frac{v^2}{\rho} \hat{u}_N$$

$$\text{Rotasjon:} \quad \vec{v} = \vec{\omega} \times \vec{r}, \quad \vec{a} = \vec{\alpha} \times \vec{r} + \vec{\omega} \times (\vec{\omega} \times \vec{r})$$

$$\text{Galilei-transformasjon, referansesystemer:} \quad \vec{r} = \vec{R} + \vec{r}', \quad \vec{v} = \vec{V} + \vec{v}'$$

$$\text{Fjærkraft:} \quad F(x) = -k(x - x_0), \quad \text{luftmotstand: } \vec{F}_v = -k\vec{v} \quad \text{eller} \quad \vec{F}_v = -D|\vec{v}|\vec{v}$$

$$\text{Statisk friksjon:} \quad |\vec{F}_s| \leq \mu_s N, \quad \text{dynamisk friksjon:} \quad |\vec{F}_d| = \mu_d N$$

$$\text{Arbeid:} \quad W_{AB} = \int_{t_A}^{t_B} \vec{F} \cdot \vec{v} dt = \int_A^B \vec{F} \cdot d\vec{r} = K_B - K_A, \quad \text{kinetisk energi:} \quad K = \frac{1}{2}mv^2$$

$$\text{Potensiell energi for gravitasjon:} \quad U = mgy, \quad \text{for fjærkraft:} \quad U = \frac{1}{2}k(x - x_0)^2$$

$$\text{Effekt:} \quad P = \lim_{\Delta t \rightarrow 0} \frac{\Delta W}{\Delta t} = \vec{F} \cdot \vec{v}$$

$$\text{Konservativ kraft:} \quad \vec{F} = -\vec{\nabla}U(\vec{r})$$

$$\text{Impuls:} \quad \vec{J} = \int_{t_0}^{t_1} \vec{F} dt = \Delta\vec{p} = \vec{p}(t_1) - \vec{p}(t_0)$$

$$\text{Rakettligningen:} \quad \vec{F}^{\text{ext}} + \vec{v}_{\text{rel}} \frac{dm}{dt} = m\vec{a}$$

$$\text{Massesenter:} \quad \vec{R} = \frac{1}{M} \sum_i m_i \vec{r}_i = \frac{1}{M} \int_M \vec{r} dm, \quad M = \sum_i m_i = \int_M dm$$

$$\text{Kraftmoment:} \quad \vec{\tau} = \vec{r} \times \vec{F}, \quad \text{spinn:} \quad \vec{L} = \vec{r} \times \vec{p}$$

$$\text{Spinnsats:} \quad \vec{\tau} = \frac{d\vec{L}}{dt}, \quad \text{stive legemer:} \quad L_z = I_z \omega_z, \quad \tau_z = I_z \alpha_z$$

$$\text{Kinetisk rotasjonsenergi:} \quad K = \frac{1}{2}I\omega^2, \quad \text{treghetsmoment:} \quad I = \sum_i m_i \rho_i^2 = \int_M \rho^2 dm$$

$$\text{Parallellakseteoremet:} \quad I = I_{cm} + Md^2$$

$$\text{Rullebetingelse:} \quad V = \omega R$$

$$\text{Fiktive krefter:} \quad m\vec{a}' = \Sigma F^{\text{ext}} - m\vec{A} - m\vec{\alpha} \times \vec{r}' - 2m\vec{\omega} \times \vec{v}' - m\vec{\omega} \times (\vec{\omega} \times \vec{r}')$$

$$\text{Gravitasjon:} \quad \vec{F}(\vec{r}) = -G \frac{m_1 m_2}{r^2} \hat{u}_r, \quad U(r) = -G \frac{m_1 m_2}{r}; \quad G \text{ er gravitasjonskonstanten}$$

$$\text{Spenning og tøyning:} \quad \sigma_{xx} = \frac{F_x}{A_x} = E \frac{\Delta x}{x} = E \epsilon_{xx}, \quad \frac{\Delta y}{y} = -\nu \frac{\Delta x}{x}$$

$$\text{Lorentz-transformasjon:} \quad x' = \gamma(x - ut), \quad y' = y, \quad z' = z, \quad t' = \gamma \left(t - \frac{u}{c^2} x \right), \quad \gamma = \frac{1}{\sqrt{1 - \frac{u^2}{c^2}}}$$

$$\text{Lorentz-transformasjon for hastighet:} \quad v' = \frac{v-u}{1 - \frac{u}{c^2} v}$$