Kinematikk og dynamikk (translatorisk og rotasjon)

Posisjon, hastighet/vinkelhastighet og akselerasjon/vinkelakselerasjon:

$$\bar{\vec{v}} = \frac{\Delta\vec{r}}{\Delta t}, \qquad \vec{v} = \frac{\mathrm{d}\vec{r}}{\mathrm{d}t}, \qquad \bar{\vec{a}} = \frac{\Delta\vec{v}}{\Delta t}, \qquad \vec{a} = \frac{\mathrm{d}\vec{v}}{\mathrm{d}t},$$
$$\vec{v}(t) = \vec{v}_0 + \int_0^t \vec{a}(t)\mathrm{d}t, \qquad \vec{r}(t) = \vec{r}_0 + \int_0^t \vec{v}(t)\mathrm{d}t$$
$$\bar{\vec{\omega}} = \frac{\Delta\vec{\theta}}{\Delta t}, \qquad \vec{\omega} = \frac{\mathrm{d}\vec{\theta}}{\mathrm{d}t} \qquad \bar{\vec{\alpha}} = \frac{\Delta\vec{\omega}}{\Delta t}, \qquad \vec{\alpha} = \frac{\mathrm{d}\vec{\omega}}{\mathrm{d}t},$$
$$\vec{\omega}(t) = \vec{\omega}_0 + \int_0^t \vec{\alpha}(t)\mathrm{d}t, \qquad \vec{\theta}(t) = \vec{\theta}_0 + \int_0^t \vec{\omega}(t)\mathrm{d}t$$

Konstant akselerasjon (x-retning) / konstant vinkelakselerasjon:

$$v_x = v_{0x} + a_x t, \qquad x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2,$$
$$v_x^2 - v_{0x}^2 = 2a_x(x - x_0), \qquad x - x_0 = \frac{1}{2}(v_{0x} + v_x)t,$$
$$\omega = \omega_0 + \alpha t, \qquad \theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2,$$
$$\omega^2 - \omega_0^2 = 2\alpha(\theta - \theta_0), \qquad \theta - \theta_0 = \frac{1}{2}(\omega_0 + \omega)t$$

Sirkelbevegelse:

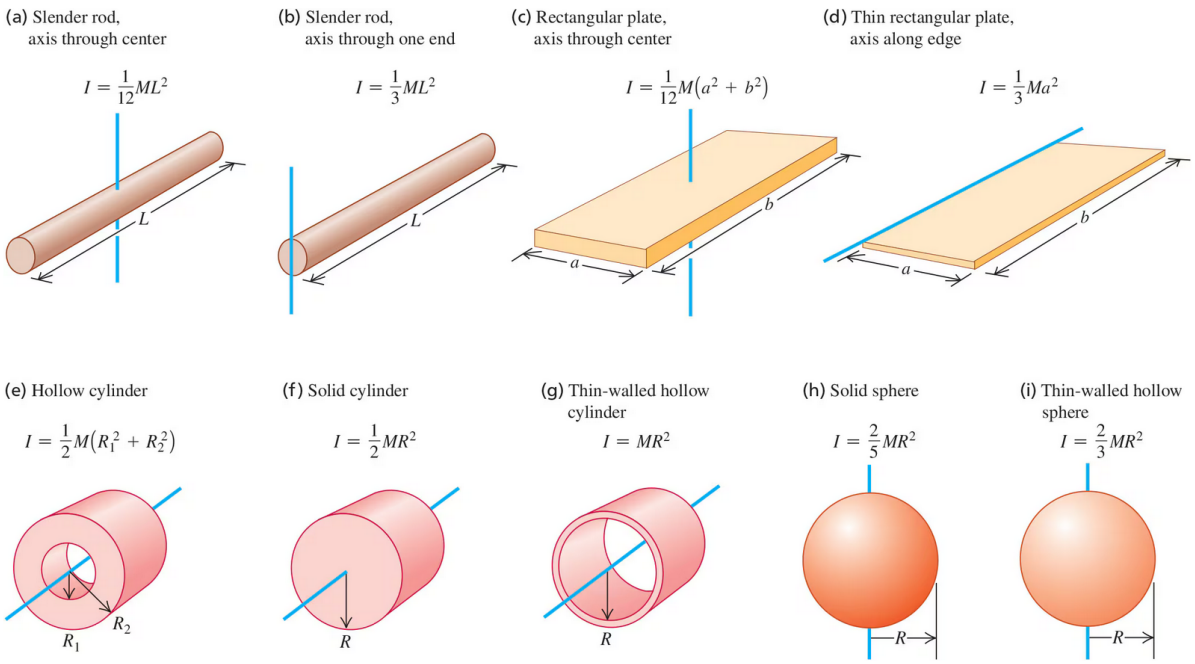
$$a_{\mathrm{rad}} = \frac{v^2}{R}, \qquad a_{\tan} = \frac{\mathrm{d}|\vec{v}|}{\mathrm{d}t}, \qquad T = \frac{2\pi R}{v},$$
$$s = R\theta, \qquad v_{\tan} = R\omega, \qquad a_{\tan} = R\alpha$$

Krefter, kraftmoment, bevegelsesmengde, kraftimpuls og angulært moment:

$$G = mg, \qquad R = \mu N, \qquad F_{\mathrm{fjær}} = kx,$$
$$\Sigma\vec{F} = m\vec{a} = \frac{\mathrm{d}\vec{p}}{\mathrm{d}t}, \qquad \vec{p} = m\vec{v}, \qquad \vec{J} = \int_{t_1}^{t_2} \Sigma\vec{F}\mathrm{d}t = \Delta\vec{p},$$
$$\vec{\tau} = \vec{r} \times \vec{F}, \qquad \Sigma\tau = I\vec{\alpha} = \frac{\mathrm{d}\vec{L}}{\mathrm{d}t}, \qquad \vec{L} = \vec{r} \times \vec{p} = I\vec{\omega}$$

Massesenter og treghetsmoment:

$$\vec{r}_{\mathrm{cm}} = \frac{\Sigma m_i \vec{r}_i}{\Sigma m_i}, \qquad I = \Sigma m_i r_i^2, \qquad I_P = I_{\mathrm{cm}} + Md^2$$



Arbeid og energi

$$W = \int \vec{F} \cdot \mathrm{d}\vec{s}, \qquad P = \frac{\mathrm{d}W}{\mathrm{d}t} = \vec{F} \cdot \vec{v}, \qquad E_K = \frac{1}{2}mv^2, \qquad E_P = mgh,$$

$$E_{\mathrm{el}} = \frac{1}{2}kx^2, \qquad W_{\Sigma F} = \Delta E_K, \qquad W_G = -\Delta E_P, \qquad W_{\mathrm{el}} = -\Delta E_{\mathrm{el}},$$

$$W_{\mathrm{andre}} = \Delta E, \qquad W = \int \vec{\tau} \cdot \mathrm{d}\vec{\theta}, \qquad P = \vec{\tau} \cdot \vec{\omega}, \qquad E_K = \frac{1}{2}I\omega^2$$

Elektrisitet og magnetisme

Elektriske felt:

$$F = \frac{1}{4\pi\epsilon_0}\frac{|q_1 q_2|}{r^2}, \qquad \vec{E} = \frac{\vec{F}_0}{q_0}, \qquad \vec{E} = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}\hat{r},$$
$$E_P = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r}, \qquad V = \frac{E_P}{q_0}, \qquad V = \frac{1}{4\pi\epsilon_0}\frac{q}{r},$$

Kapasitans og dielektrikum:

$$C = \frac{Q}{V_{ab}}, \qquad C_{\text{plate}} = \epsilon\frac{A}{d}, \qquad \frac{1}{C_{\text{s}}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots,$$
$$C_{\text{p}} = C_1 + C_2 + \cdots, \qquad E_{\text{kond}} = \frac{Q^2}{2C}, \qquad u = \frac{1}{2}\epsilon E^2, \qquad K = \frac{C}{C_0} = \frac{\epsilon}{\epsilon_0},$$

Strøm og elektriske kretser:

$$I = \frac{\Delta Q}{\Delta t}, \qquad R = \frac{V_{ab}}{I}, \qquad V_{\text{pol}} = R_y I = \mathcal{E} - r_i I, \qquad P = V_{ab} I,$$
$$R_{\text{s}} = R_1 + R_2 + \cdots, \qquad \frac{1}{R_{\text{p}}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots,$$

Magnetiske krefter og magnetfelt:

$$\vec{F} = q\vec{v} \times \vec{B} = I\vec{l} \times \vec{B}, \qquad \Phi_B = B_\perp A, \qquad \vec{B} = \frac{\mu_0}{4\pi}\frac{q\vec{v} \times \hat{r}}{r^2} = \frac{\mu_0}{4\pi}\int \frac{Id\vec{l} \times \hat{r}}{r^2},$$
$$B_{\text{rett leder}} = \frac{\mu_0 I}{2\pi r}, \qquad \frac{F}{L} = \frac{\mu_0 I I'}{2\pi r}, \qquad (B_x)_{\text{coil}} = \frac{\mu_0 N I a^2}{2(x^2 + x^2)^{3/2}},$$

Elektromagnetisk induksjon:

$$\mathcal{E} = -\frac{d\Phi_B}{dt}, \qquad \mathcal{E} = vBL,$$

Sammenheng mellom enheter

$$
\begin{aligned}
1\ \mathrm{N} &= 1\ \mathrm{kg\,m/s^2} \\
1\ \mathrm{J} &= 1\ \mathrm{Nm} = 1\ \mathrm{kg\,m^2/s^2} \\
1\ \mathrm{W} &= 1\ \mathrm{J/s} \\
1\ \mathrm{V} &= 1\ \mathrm{J/C} \\
1\ \mathrm{eV} &= 1{,}602 \cdot 10^{-19}\ \mathrm{J} \\
1\ \mathrm{F} &= 1\ \mathrm{C/V} \\
1\ \mathrm{A} &= 1\ \mathrm{C/s} \\
1\ \Omega &= 1\ \mathrm{V/A} \\
1\ \mathrm{T} &= 1\ \mathrm{N/(A \cdot m)} \\
1\ \mathrm{Wb} &= 1\ \mathrm{T \cdot m^2}
\end{aligned}
$$

Fysiske konstanter

$$
\begin{aligned}
g &= 9{,}81\ \mathrm{m/s^2} \\
e &= 1{,}602 \cdot 10^{-19}\ \mathrm{C} \\
\epsilon_0 &= 8{,}854 \cdot 10^{-12}\ \mathrm{C^2/(N \cdot m^2)} \\
\frac{1}{4\pi\epsilon_0} &= 8{,}988 \times 10^{9}\ \mathrm{N \cdot m^2/C^2} \\
m_e &= 9{,}109 \cdot 10^{-31}\ \mathrm{kg} \\
m_p &= 1{,}673 \cdot 10^{-27}\ \mathrm{kg} \\
m_n &= 1{,}675 \cdot 10^{-27}\ \mathrm{kg} \\
\mu_0 &= 4\pi \times 10^{-7}\ \mathrm{Wb/A \cdot m}
\end{aligned}
$$

SI-prefikser

femto	f	10^{-15}
piko	p	10^{-12}
nano	n	10^{-9}
mikro	μ	10^{-6}
milli	m	10^{-3}
centi	c	10^{-2}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}