Vigrar:

$$\mathbf{A} \cdot \mathbf{B} = AB\cos\theta = A_xB_x + A_yB_y + A_zB_z$$

$$\mathbf{A} \times \mathbf{B} = \begin{vmatrix} \hat{\mathbf{i}} & \hat{\mathbf{j}} & \hat{\mathbf{k}} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$$

$$|\ \mathbf{A} \times \mathbf{B}\ | = AB\sin\theta$$

$$\hat{\mathbf{C}} = \frac{\mathbf{C}}{|\ \mathbf{C}\ |}$$

Hornafræði:

$$C^2 = A^2 + B^2 - 2AB\cos\gamma$$

$$\frac{\sin\alpha}{A} = \frac{\sin\beta}{B} = \frac{\sin\gamma}{C}$$

$$\sin(x+y) = \sin x\cos y + \cos x\sin y$$

$$\cos(x+y) = \cos x\cos y - \sin x\sin y$$

$$\sin x + \sin y = 2\sin(\frac{x+y}{2})\cos(\frac{x-y}{2})$$

$$\cos x + \cos y = 2\cos(\frac{x+y}{2})\cos(\frac{x-y}{2})$$

$$\sin(-x) = -\sin x$$

$$\cos(-x) = \cos x$$

Raðir:

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2}x^2 + o(x^3)$$

$$\ln(1+x) = x - \frac{1}{2}x^2 + o(x^3)$$

Hreyfilýsing:

$$\mathbf{v} = \mathbf{v}_0 + \mathbf{a}t$$

$$\mathbf{r} = \mathbf{r}_0 + \frac{1}{2}(\mathbf{v}_0 + \mathbf{v})t$$

$$\mathbf{r} = \mathbf{r}_0 + \mathbf{v}_0 t + \frac{1}{2}\mathbf{a}t^2$$

$$v^2 = {v_0}^2 + 2\mathbf{a}\cdot\Delta\mathbf{r}$$

$$\mathbf{v} = \omega \times \mathbf{r}$$

$$\mathbf{a} = \omega \times \mathbf{v}$$

$$\mathbf{a}_r = -\frac{v^2}{r}\hat{\mathbf{r}}$$

$$\mathbf{a}_t = \frac{dv}{dt}\hat{\theta}$$

$$\omega = 2\pi\nu$$

$$\nu = \frac{1}{T}$$

$$\omega = \omega_0 + \alpha t$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2$$

$$\omega^2 = \omega_0^2 + 2\alpha\Delta\theta$$

$$\mathbf{r}' = \mathbf{r} - \mathbf{u}t$$

$$\mathbf{v}' = \mathbf{v} - \mathbf{u}$$

$$\mathbf{a}' = \mathbf{a}$$

Hreyfifræði:

$$\mathbf{F} = m\mathbf{a}$$

$$F = \frac{GmM}{r^2}$$

$$\mathbf{W} = m\mathbf{g}$$

$$F = -kx$$

$$f_s \le f_{s,max} = \mu_s N$$

$$f_k = \mu_k N$$

$$a = 2\omega v_r$$

$$W_{A\to B} = \int_A^B \mathbf{F}\cdot d\mathbf{s}$$

$$K = \frac{1}{2}mv^2$$

$$W_{net} = \Delta K$$

$$P = \mathbf{F} \cdot \mathbf{v}$$

$$\Delta U = U_B - U_A = -\int_A^B \mathbf{F}_c \cdot d\mathbf{s}$$

$$U_g = mgh$$

$$U_{sp} = \frac{1}{2}kx^2$$

$$E = K + U$$

$$\mathbf{F} = -\nabla U$$

$$U(r) = -\frac{GmM}{r}$$

$$\mathbf{p} = m\mathbf{v}$$

$$\mathbf{F} = \frac{d\mathbf{p}}{dt}$$

$$\mathbf{I} = \int \mathbf{F} dt = \Delta \mathbf{p}$$

$$M = \sum m_i$$

$$\mathbf{r}_{cm} = \frac{1}{M}\sum m_i \mathbf{r}_i$$

$$\mathbf{r}_{cm} = \frac{1}{M}\int \mathbf{r} dm$$

$$\mathbf{P} = \sum \mathbf{p}_i = M\mathbf{v}_{cm}$$

$$\frac{d\mathbf{P}}{dt} = \mathbf{F}_{ext} = M\mathbf{a}_{cm}$$

$$\mathbf{v}_{rel} = \mathbf{u} - \mathbf{v}$$

$$M\frac{d\mathbf{v}}{dt} = \mathbf{F}_{ext} + \mathbf{v}_{rel}\frac{dM}{dt}$$

$$\mathbf{P}_{cm} = 0$$

$$K_{cm} = \frac{1}{2}Mv_{cm}^2$$

$$K = K_{cm} + K_{rel}$$

Snúningur:

$$I = \sum m_i r_i^2$$

$$I = \int r^2 dm$$

$$I = I_{cm} + Mh^2$$

$$K = \frac{1}{2}I_z\omega^2$$

$$\tau = \mathbf{r} \times \mathbf{F}$$

$$\tau_z = I_z\alpha$$

$$P = \tau_z\omega$$

$$\mathbf{l} = \mathbf{r} \times \mathbf{p}$$

$$\mathbf{L} = \sum \mathbf{l}_i = \sum (\mathbf{r}_i \times \mathbf{p}_i)$$

$$L_z = I_z\omega$$

$$\tau = \frac{d\mathbf{l}}{dt}$$

$$\tau_{ext} = \frac{d\mathbf{L}}{dt}$$

Þyngdarafl:

$$\mathbf{F} = -\frac{Gm_1m_2}{r^2}\hat{\mathbf{r}}$$

$$\mathbf{g} = -\frac{GM_r}{r^2}\hat{\mathbf{r}}$$

$$T^2 = \kappa a^3$$

$$\kappa = \frac{4\pi^2}{GM}$$

$$E = \frac{1}{2}mv^2 - \frac{GMm}{r} = -\frac{GMm}{2a}$$

$$U = -\int \frac{GmdM}{s}$$

Fjaðrandi efni og vökvar:

$$s_n = \frac{F_n}{A}$$

$$s_t = \frac{F_t}{A}$$

$$e_l = \frac{\Delta L}{L_0}$$

$$e_t = \frac{\Delta d}{d}$$

$$\sigma = -\frac{e_t}{e_l}$$

$$Y = \frac{s_n}{e_l}$$

$$k = Y\frac{A}{l}$$

$$s_t = \mu\frac{\Delta x}{h}$$

$$\mu = \frac{Y}{2(1+\sigma)}$$

$$B = \beta = -\Delta P\frac{V}{\Delta V}$$

$$P = \frac{F_n}{A}$$

$$P = P_0 + \rho g h$$

$$F_B = \rho V g$$

$$\rho A v = fasti$$

$$P + \rho g h + \frac{1}{2}\rho v^2 = fasti$$

Sveiflur og bylgjur:

$$x(t) = A\sin(\omega t + \phi)$$

$$\frac{d^2x}{dt^2} + \omega^2 x = 0$$

$$\omega_0 = \sqrt{\frac{k}{m}}$$

$$T = \frac{2\pi}{\omega_0}$$

$$T_0 = 2\pi\sqrt{\frac{L}{g}}$$

$$T_0 = 2\pi\sqrt{\frac{I}{mgd}}$$

$$T_0 = 2\pi\sqrt{\frac{I}{\kappa}}$$

$$x(t) = A_0 e^{-\gamma t/2m}\cos(\omega' t + \phi)$$

$$\omega' = \sqrt{\omega_0^2 - \left(\frac{\gamma}{2m}\right)^2}$$

$$x(t) = A\cos(\omega_e t + \delta)$$

$$A(\omega_e) = \frac{F_0/m}{\sqrt{(\omega_0^2 - \omega_e^2)^2 + \left(\frac{\gamma\omega_e}{m}\right)^2}}$$

$$\omega_R = \sqrt{\omega_0^2 - 2\left(\frac{\gamma}{2m}\right)^2}$$

$$Q = \frac{m\omega_0}{\gamma}$$

$$v = \sqrt{\frac{F}{\mu}}$$

$$v = f\lambda$$

$$k = \frac{2\pi}{\lambda}$$

$$y(x,t) = A\sin(kx - \omega t + \phi)$$

$$\lambda_n = \frac{2L}{n}$$

$$\frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2}$$

$$P = P_{max}\sin^2(kx - \omega t + \phi)$$

$$P_{max} = \mu\omega^2 A^2 v$$

$$P_{av} = \frac{1}{2}P_{max}$$

$$v = \sqrt{\frac{B}{\rho_0}}$$

$$f_n = \frac{nv}{4L}$$

$$f_n = \frac{nv}{2L}$$

$$f = \left(\frac{v \pm v_0}{v \pm v_s}\right) f_0$$

$$I = \frac{P_{av}}{A}$$

$$P_{av} = \frac{1}{2}\rho A\omega^2 s_0^2 v = \frac{p_0^2 A}{2\rho v}$$

$$p_0 = \rho\omega v s_0$$

$$\beta = 10 \log \frac{I}{I_0}$$

Varmafræði:

$$C = \frac{5}{9}(F - 32)$$

$$K = 273,15 + C$$

$$PV = NkT$$

$$PV = nRT$$

$$R = kN_A$$

$$\alpha = \frac{1}{l}\frac{dl}{dT}$$

$$\beta = \frac{1}{V}\frac{dV}{dT}$$

$$\Delta Q = mc\Delta T$$

$$\Delta Q = nC\Delta T$$

$$\Delta Q = mL$$

$$dW = PdV$$

$$\Delta U = Q - W$$

$$dQ = dW + dU$$

$$\Delta U = nC_V\Delta T$$

$$C_P - C_V = R$$

$$PV^\gamma = fasti$$

$$\gamma = \frac{C_P}{C_V}$$

$$\frac{dQ}{dt} = -\kappa A\frac{dT}{dx}$$

$$R = \frac{L}{\kappa}$$

$$v_{rms} = \sqrt{\frac{3kT}{m}}$$

$$P = \frac{1}{3}\rho v_{rms}^2$$

$$\bar{K} = \frac{1}{2}mv_{rms}^2$$

$$\bar{K} = \frac{3}{2}kT$$

$$C_V = \frac{3}{2}R$$

$$C_V = \frac{5}{2}R$$

$$C_V = \frac{7}{2}R$$

$$C_V = 3R$$

$$dN = 4\pi N\left(\frac{m}{2\pi kT}\right)^{3/2} v^2 e^{-mv^2/2kT}dv$$

$$\bar{v} = v_{av} = \sqrt{\frac{8kT}{\pi m}}$$

$$v_{mp} = \sqrt{\frac{2kT}{m}}$$

$$\left(P + a\left(\frac{n}{V}\right)^2\right)\left(\frac{V}{n} - b\right) = RT$$

$$\epsilon = \frac{W}{|Q_H|} = 1 - \frac{|Q_C|}{|Q_H|}$$

$$COP = \frac{|Q_C|}{W}$$

$$COP = \frac{|Q_H|}{W}$$

$$\epsilon = 1 - \frac{T_C}{T_H}$$

$$r = \frac{V_2}{V_3}$$

$$\epsilon = 1 - \frac{1}{r^{(\gamma-1)}}$$

$$dS = \frac{dQ}{T}$$

$$\Delta S = \int_A^B \frac{dQ}{T}$$

$$\Delta S = nC_V \ln\frac{T_2}{T_1} + nR\ln\frac{V_2}{V_1}$$

$$\Delta S_K \geq \int_1^2 \frac{dQ}{T}$$

$$\Delta S \geq 0$$

$$W = Q_H - T_C|\Delta S_H|$$