Équations importantes du tome 1

$$\Delta x = x - x_0$$
$$\vec{s} = \Delta\vec{r} = \vec{r} - \vec{r}_0$$

$$\bar{v}_x = \frac{\Delta x}{\Delta t} \qquad \bar{\vec{v}} = \frac{\Delta\vec{r}}{\Delta t} = \frac{\vec{s}}{\Delta t}$$
$$v_x = \lim_{\Delta t\to 0}\frac{\Delta x}{\Delta t} = \frac{\mathrm{d}x}{\mathrm{d}t}$$
$$\vec{v} = \lim_{\Delta t\to 0}\frac{\Delta\vec{r}}{\Delta t} = \frac{\mathrm{d}\vec{r}}{\mathrm{d}t}$$

$$\bar{a}_x = \frac{\Delta v_x}{\Delta t} \qquad \bar{\vec{a}} = \frac{\Delta\vec{v}}{\Delta t}$$
$$a_x = \lim_{\Delta t\to 0}\frac{\Delta v_x}{\Delta t} = \frac{\mathrm{d}v_x}{\mathrm{d}t}$$
$$\vec{a} = \lim_{\Delta t\to 0}\frac{\Delta\vec{v}}{\Delta t} = \frac{\mathrm{d}\vec{v}}{\mathrm{d}t}$$

$$\mathrm{VSM} = \frac{\mathrm{DP}}{\Delta t}$$

$$v_{x\mathbf{AR}} = v_{x\mathbf{AB}} + v_{x\mathbf{BR}}$$
$$\vec{v}_{\mathbf{AR}} = \vec{v}_{\mathbf{AB}} + \vec{v}_{\mathbf{BR}}$$
$$v_{x\mathbf{AB}} = -v_{x\mathbf{BA}}$$
$$\vec{v}_{\mathbf{AB}} = -\vec{v}_{\mathbf{BA}}$$

$$v_x = v_{x0} + a_x t$$
$$x = x_0 + v_{x0}t + \tfrac{1}{2}a_x t^2$$
$$x = x_0 + \left(\frac{v_{x0} + v_x}{2}\right)t$$
$$v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$$

$$T = \frac{2\pi r}{v} \qquad f = \frac{1}{T}$$

$$a_C = \frac{v^2}{r}$$

$$\sum\vec{F} = m\vec{a}$$
$$\vec{F}_{\mathbf{A}\,\mathrm{sur}\,\mathbf{B}} = -\vec{F}_{\mathbf{B}\,\mathrm{sur}\,\mathbf{A}}$$

$$F_g = \frac{Gm_1m_2}{r^2}$$
$$\vec{F}_g = m\vec{g} \qquad g = \frac{Gm}{r^2}$$

$$\rho = \frac{m}{V}$$

$$F_r = k|e| \qquad e = L - L_{\mathrm{nat}}$$

$$f_c = \mu_c n \qquad 0 \le f_s \le \mu_s n$$

$$F_A = \rho_f V g$$

$$P = \frac{F}{A} \qquad P_{\mathbf{B}} = P_{\mathbf{S}} + \rho g h$$
$$\tilde{P} = P - P_{\mathrm{atm}}$$

$$W = \vec{F}\bullet\vec{s} \qquad W = Fs\cos\theta_{Fs}$$
$$W = F_x\Delta x + F_y\Delta y + F_z\Delta z$$

$$K = \tfrac{1}{2}mv^2$$
$$K_f = K_i + W_{\mathrm{tot}} \qquad \Delta K = W_{\mathrm{tot}}$$

$$U_r = \tfrac{1}{2}ke^2$$

$$U_g = mgy \qquad \Delta U_g = mg\Delta y$$
$$U_g = -\frac{Gm_1m_2}{r}$$

$$E = K + U$$
$$E_f = E_i + W_{\mathrm{nc}} \qquad \Delta E = W_{\mathrm{nc}}$$

$$W_c = -\Delta U \qquad F_x = -\frac{\mathrm{d}U}{\mathrm{d}x}$$

$$v_{\mathrm{lib}} = \sqrt{\frac{2Gm}{r}}$$

$$\bar{P} = \frac{\Delta(\text{énergie})}{\Delta t} \qquad \bar{P} = \frac{W}{\Delta t}$$
$$P = \vec{F}\bullet\vec{v} \qquad P = Fv\cos\theta_{Fv}$$

$$Q = mc\Delta T$$
$$Q = mL_f \qquad Q = mL_v$$

$$\vec{p} = m\vec{v} \qquad \sum\vec{p}_f = \sum\vec{p}_i$$
$$\sum\vec{F} = \frac{\mathrm{d}\vec{p}}{\mathrm{d}t}$$
$$\sum\vec{F}_{\mathrm{ext}} = 0 \rightarrow \sum\vec{p} = \text{constante}$$

$$v_{x\mathbf{Bf}} - v_{x\mathbf{Af}} = -(v_{x\mathbf{Bi}} - v_{x\mathbf{Ai}})$$

$$\vec{J} = \Delta\vec{p} \qquad \vec{J} = \sum\vec{F}\,\Delta t$$

$$\omega = \frac{\mathrm{d}\theta}{\mathrm{d}t} \qquad \alpha = \frac{\mathrm{d}\omega}{\mathrm{d}t}$$

$$\omega = \omega_0 + \alpha t$$
$$\theta = \theta_0 + \omega_0 t + \tfrac{1}{2}\alpha t^2$$
$$\theta = \theta_0 + \left(\frac{\omega_0 + \omega}{2}\right)t$$
$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$$x = r\theta \qquad v_x = r\omega \qquad a_x = r\alpha$$

$$a_C = r\omega^2$$

$$\tau = \pm rF_\perp = \pm rF\sin\phi$$
$$\vec{\tau} = \vec{r}\times\vec{F}$$

$$\sum\vec{F} = 0 \qquad \sum\tau = 0$$

$$\vec{r}_{\mathrm{CM}} = \frac{\sum m_i\vec{r}_i}{\sum m_i}$$

$$I = mr^2 \qquad I = \int r^2\,\mathrm{d}m$$
$$I = mh^2 + I_{\mathrm{CM}}$$

Cylindre : $I_{\mathrm{CM}} = \frac{1}{2}mR^2$

Sphère : $I_{\mathrm{CM}} = \frac{2}{5}mR^2$

Coquille : $I_{\mathrm{CM}} = \frac{2}{3}mR^2$

Tige (centre) : $I_{\mathrm{CM}} = \frac{1}{12}mL^2$

Tige (extrémité) : $I = \frac{1}{3}mL^2$

$$K = \tfrac{1}{2}I\omega^2$$
$$K = \tfrac{1}{2}I_{\mathrm{CM}}\omega^2 + \tfrac{1}{2}mv_{\mathrm{CM}}^2$$

$$W = \tau\,\Delta\theta \qquad P = \tau\omega$$

$$\sum\tau = I\alpha \qquad \sum\vec{\tau} = I\vec{\alpha}$$

$$L = I\omega \qquad \vec{L} = I\vec{\omega}$$
$$\vec{L} = \vec{r}\times\vec{p} \qquad \sum\vec{\tau} = \frac{\mathrm{d}\vec{L}}{\mathrm{d}t}$$
$$\sum\vec{\tau}_{\mathrm{ext}} = 0 \rightarrow \sum\vec{L} = \text{constante}$$

$$g = 9{,}8\ \mathrm{m/s^2}$$
$$G = 6{,}67\times10^{-11}\,\mathrm{N{\cdot}m^2/kg^2}$$
$$P_{\mathrm{atm}} = 101{,}3\ \mathrm{kPa}$$
$$1\ \mathrm{mmHg} = 133{,}3\ \mathrm{Pa}$$
$$1\ \mathrm{cal} = 4{,}19\ \mathrm{J}$$
$$T(\mathrm{K}) = T(^\circ\mathrm{C}) + 273{,}15$$

$$ax^2 + bx + c = 0$$
$$\rightarrow x = \frac{-b\pm\sqrt{b^2 - 4ac}}{2a}$$

$$C = 2\pi r \qquad A = \pi r^2$$

$$A = 4\pi r^2 \qquad V = \frac{4}{3}\pi r^3$$

$$(1+x)^n \approx 1 + nx \quad (x \ll 1)$$
$$\sin\theta \approx \tan\theta \approx \theta \quad (\theta \ll 1\ \mathrm{rad})$$

$$|A_{\mathrm{opp}}| = A\sin\phi$$
$$|A_{\mathrm{adj}}| = A\cos\phi$$
$$\phi = \arctan\left|\frac{A_{\mathrm{opp}}}{A_{\mathrm{adj}}}\right|$$
$$A = \sqrt{A_{\mathrm{adj}}^2 + A_{\mathrm{opp}}^2}$$

$$\frac{\sin\alpha}{A} = \frac{\sin\beta}{B} = \frac{\sin\gamma}{C}$$
$$C^2 = A^2 + B^2 - 2AB\cos\gamma$$

$$\sin^2\theta + \cos^2\theta = 1$$
$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\vec{A}\bullet\vec{B} = AB\cos\theta_{AB}$$
$$\vec{A}\bullet\vec{B} = A_xB_x + A_yB_y + A_zB_z$$
$$\|\vec{A}\times\vec{B}\| = AB\sin\theta_{AB}$$

$$\frac{\mathrm{d}}{\mathrm{d}x}x^A = A\,x^{A-1}$$
$$\frac{\mathrm{d}}{\mathrm{d}x}e^{Ax} = A\,e^{Ax}$$
$$\frac{\mathrm{d}}{\mathrm{d}x}\ln(Ax) = \frac{1}{x}$$
$$\frac{\mathrm{d}}{\mathrm{d}x}\sin(Ax) = A\cos(Ax)$$
$$\frac{\mathrm{d}}{\mathrm{d}x}\cos(Ax) = -A\sin(Ax)$$