

## Formulário

$$\vec{r}(t); \quad \vec{v}(t) = \frac{d\vec{r}(t)}{dt}; \quad \vec{a}(t) = \frac{d^2\vec{r}(t)}{dt^2}; \quad \vec{a}_c = \frac{v^2}{r} \hat{u}_n; \quad \vec{a}_t = \frac{dv}{dt} \hat{u}_t;$$

$$\theta(t); \quad \omega(t) = \frac{d\theta(t)}{dt}; \quad \alpha(t) = \frac{d^2\theta(t)}{dt^2}; \quad \omega = 2\pi f = \frac{2\pi}{T};$$

$$\vec{v} = \vec{v}' + \vec{\omega} \times \vec{r}'; \quad \vec{a} = \vec{a}' + 2\vec{\omega} \times \vec{v}' + \vec{\omega} \times (\vec{\omega} \times \vec{r}');$$

$$\vec{r}_{cm} = \frac{\sum_i m_i \vec{r}_i}{\sum_i m_i}; \quad \vec{F} = -G \frac{m_1 m_2}{r^2} \hat{u}_r; \quad E_{pg} = -G \frac{m_1 m_2}{r};$$

$$W = \int_{\vec{r}_i}^{\vec{r}_f} \vec{F} \cdot d\vec{r}; \quad W = \Delta E_c; \quad W_c = -\Delta E_p;$$

$$\vec{F} = \frac{d\vec{p}}{dt}; \quad \vec{p} = m\vec{v}; \quad \vec{I} = \int_{t_i}^{t_f} \vec{F} dt; \quad \vec{F}_{a, cin} = \mu_c \vec{N}; \quad I = \rho V g;$$

$$\vec{L} = \vec{r} \times \vec{p}; \quad \vec{L} = I \vec{\omega}; \quad I = \sum_i m_i r_i^2; \quad \vec{\tau} = I \vec{\alpha}; \quad \vec{\tau}_F = \vec{r} \times \vec{F}$$

$$\vec{F}_{el} = -k\vec{x}; \quad x(t) = A \cos(\omega t + \delta); \quad \omega = \sqrt{k/m}; \quad \omega = 2\pi/T; \quad f = 1/T;$$

$$\theta(t) = \theta_0 \cos(\omega t + \delta); \quad \omega = \sqrt{g/l};$$

$$E_c = (1/2)mv^2; \quad E_p = (1/2)kx^2;$$

$$\vec{F} = -k\vec{x} - b\vec{v}; \quad x(t) = A_0 e^{-(b/2m)t} \cos(\omega t + \delta); \quad \omega = \sqrt{\frac{k}{m} - \left(\frac{b}{2m}\right)^2};$$

$$\vec{F} = -k\vec{x} - b\vec{v} + \vec{F}_{ext}; \quad F_{ext} = F_0 \cos(\omega_f t); \quad x(t) = A \cos(\omega_f t + \delta);$$

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

$$\vec{F} = k \frac{q_1 q_2}{r_{12}^2} \hat{r}_{12}; \quad \vec{E} = \frac{\vec{F}}{q} = k \frac{q}{r^2} \hat{r}; \quad V_p = -\int_{\infty}^p \vec{E} \cdot d\vec{s}; \quad \vec{F} = q\vec{v} \times \vec{B}; \quad \Delta U = q\Delta V = \int \vec{E} \cdot d\vec{s}$$

### Constantes:

$$e = 1,602 \times 10^{-19} \text{ C}; \quad \text{massa electrão} = 9,109 \times 10^{-31} \text{ kg};$$

$$\text{massa protão} = 1,673 \times 10^{-27} \text{ kg}; \quad \text{massa neutrão} = 1,675 \times 10^{-27} \text{ kg}$$

$$G = 6,67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}; \quad k = 1/4\pi\epsilon_0 = 8,988 \times 10^9 \text{ Nm}^2\text{C}^{-2};$$

$$M_T = 5,98 \times 10^{24} \text{ kg}; \quad R_T = 6,37 \times 10^6 \text{ m};$$

$$D_{T-S} = 1,496 \times 10^{11} \text{ m}; \quad M_S = 1,991 \times 10^{30} \text{ kg}$$