Possibly Useful Information

Constants & Conversions:

$g = 9.81\ \text{m/s}^2$ $\quad$ 1 rev = $360^\circ = 2\pi$ rad $\quad$ 1 N = 1 kg·m/s^2

c = Speed of light = 3.00×10^8 m/s $\quad$ 1 u = 1.67×10^{-27} kg

1 J = 1 N·m $\quad$ 1 W = J/s

Forces:

$$\sum \vec{F} = m\vec{a} \qquad \vec{F}_g = mg \qquad \vec{F}_{AB} = -\vec{F}_{BA} \qquad F_{sp} = -kx$$

$$f_s \le \mu_s N \qquad f_{s,\max} = \mu_s N \qquad f_k = \mu_k N \qquad F_c = \frac{mv^2}{r}$$

Work and Energy:

$$W = \vec{F} \cdot \vec{d} \qquad W = \int_{x_i}^{x_f} F_x dx + \int_{y_i}^{y_f} F_y dy + \int_{z_i}^{z_f} F_z dx \qquad W_{sp} = -\frac{1}{2}k\left(x_f^2 - x_i^2\right)$$

$$W = \Delta K \qquad K = \frac{1}{2}mv^2 \qquad P_{ave} = \frac{\Delta W}{\Delta t} \qquad P = \frac{dW}{dt} = \vec{F} \cdot \vec{v}$$

$$E_{mec} = U + K$$

$$U(x_f) - U(x_i) = -\int_{x_i}^{x_f} F(x)dx \qquad \vec{F}(x) = -\frac{dU}{dx}\hat{i} \qquad \vec{F}(x,y,z) = -\vec{\nabla} U$$

$$U_g = mgy \qquad U_{sp} = \frac{1}{2}kx^2 \qquad E = mc^2$$

Systems:

$$x_{cm} = \frac{1}{M}\sum_i m_i x_i \qquad x_{cm} = \frac{1}{M}\int x\,dm \qquad \vec{r}_{cm} = \frac{1}{M}\sum_i m_i \vec{r}_i \qquad \vec{r}_{cm} = \frac{1}{M}\int \vec{r}\,dm$$

$$\vec{v}_{cm} = \frac{d\vec{r}_{cm}}{dt} \qquad \vec{a}_{cm} = \frac{d\vec{v}_{cm}}{dt} = \frac{d^2\vec{r}_{cm}}{dt^2} \qquad \sum \vec{F}_{ext} = M\vec{a}_{cm}$$

$$\int_{x_i}^{x_f} F_{ext} dx_{cm} = \Delta K_{cm} \qquad K_{cm} = \frac{1}{2}Mv_{cm}^2 \qquad M = \sum_i m_i \qquad M = \int dm$$

$$Rv_{rel} = Ma \qquad v_f - v_i = v_{rel} \ln\frac{M_i}{M_f}$$

Momentum & Collisions:

$$\vec{I} = \Delta\vec{p} = \int_{t_1}^{t_2} \vec{F}(t)dt \qquad \vec{I} = \vec{F}_{ave}\Delta t \qquad \vec{p} = m\vec{v} \qquad \vec{p}_f = \vec{p}_i$$

$$\vec{P} = M\vec{v}_{cm} \qquad \sum \vec{F} = \frac{d\vec{p}}{dt} \qquad \sum \vec{F}_{ext} = \frac{d\vec{P}}{dt}$$

1-D Elastic: $K_{1i} + K_{2i} = K_{1f} + K_{2f}$

$$v_{1f} = \frac{m_1 - m_2}{m_1 + m_2}v_{1i} + \frac{2m_2}{m_1 + m_2}v_{2i} \qquad v_{2f} = \frac{2m_1}{m_1 + m_2}v_{1i} + \frac{m_2 - m_1}{m_1 + m_2}v_{2i}$$

Even More Possibly Useful Information

Rotational Motion:

$$\Delta\omega = \alpha t \qquad \Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2 \qquad \omega^2 = \omega_0^2 + 2\alpha(\Delta\theta)$$

$$\Delta\theta = \frac{1}{2}(\omega + \omega_0)t \qquad \Delta\theta = \omega t - \frac{1}{2}\alpha t^2$$

$$s = r\theta \qquad v = r\omega \qquad a_t = r\alpha \qquad a_r = r\omega^2$$

$$I = \sum_i m_i r_i^2 \qquad I = \int r^2 dm \qquad I = I_{cm} + Md^2 \qquad I_{cm} = \beta MR^2$$

$$\vec{\tau} = \vec{r} \times \vec{F} = r_\perp F = I\vec{\alpha} \qquad W = \int_{\theta_i}^{\theta_f} \tau d\theta \qquad P_{ave} = \tau\omega \qquad P = \int_{\omega_i}^{\omega_f} \tau d\omega$$

$$K_{tot} = K_{cm} + K_{rot} \qquad K_{rot} = \frac{1}{2}I\omega^2$$

$$\vec{\tau} = \frac{d\vec{l}}{dt} \qquad \vec{l} = \vec{r} \times \vec{p} \qquad \vec{\tau}_{ext} = \frac{d\vec{L}}{dt} \qquad \vec{L} = I\vec{\omega} \qquad \vec{L}_i = \vec{L}_f$$