

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

$$\vec{\mathbf{F}}_{B \text{ on } A} = -\vec{\mathbf{F}}_{A \text{ on } B}$$

$$w = mg$$

$$f_s \leq \mu_s n, f_k = \mu_k n$$

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

$$W = \vec{\mathbf{F}} \cdot \vec{\mathbf{s}} = F s \cos \phi$$

$$W = \int_{x_1}^{x_2} F_x dx = \int_{P_1}^{P_2} \vec{\mathbf{F}} \cdot d\vec{\ell}$$

$$W_{tot} = K_2 - K_1 = \Delta K$$

$$P = dW/dt$$

$$W = -\Delta U$$

$$U = mgh, U = \frac{1}{2}kx^2$$

$$K_2 + U_2 = K_1 + U_1 + W_{other}$$

$$F_x(x) = -dU(x)/dx$$

$$\vec{\mathbf{F}} = -\left[\frac{\partial U}{\partial x}\hat{\mathbf{i}} + \frac{\partial U}{\partial y}\hat{\mathbf{j}} + \frac{\partial U}{\partial z}\hat{\mathbf{k}}\right]$$

$$v_x = dx/dt, v_{av-x} = (x_2 - x_1)/(t_2 - t_1)$$

$$a_x = dv_x/dt, a_{av-x} = (v_{2x} - v_{1x})/(t_2 - t_1)$$

$$x(t) = x_0 + \int_0^t v_x(t) dt$$

$$v_x(t) = v_{0x} + \int_0^t a_x(t) dt$$

$$\vec{\mathbf{v}} = d\vec{\mathbf{r}}/dt$$

$$\vec{\mathbf{a}} = d\vec{\mathbf{v}}/dt$$

$$x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2$$

$$v_x(t) = v_{0x} + a_x t$$

$$v_x(t)^2 = v_{0x}^2 + 2a_x \Delta x$$

$$\Delta x = \frac{v_{0x} + v_x(t)}{2}t$$

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

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

$$\vec{\mathbf{A}} = A_x\hat{\mathbf{i}} + A_y\hat{\mathbf{j}} + A_z\hat{\mathbf{k}}$$

$$A_x = A \cos \theta, A_y = A \sin \theta$$

$$A = \sqrt{A_x^2 + A_y^2}, \tan \theta = A_y/A_x$$

$$\vec{\mathbf{A}} \cdot \vec{\mathbf{B}} = AB \cos \theta = A_x B_x + A_y B_y + A_z B_z$$

$$a_{rad} = v^2/R = 4\pi^2 R/T^2$$

$$\vec{\mathbf{v}}_{P/A} = \vec{\mathbf{v}}_{P/B} + \vec{\mathbf{v}}_{B/A}$$

$$g = 9.80 \text{ m/s}^2, 1 \text{ hr} = 3600 \text{ s}, 1 \text{ km/hr} = 0.278 \text{ m/s}$$

$$\text{If } at^2 + bt + c = 0, \text{ then } t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

$$\text{If } x = at^n, \text{ then } dx/dt = nat^{n-1}.$$

$$\text{If } x = at^n, \text{ then } \int_{t_1}^{t_2} x(t) dt = \frac{a}{n+1} (t_2^{n+1} - t_1^{n+1}).$$