P11 - 0-0 - Formula Sheet

MKS Units - Meters/Kilograms/Seconds

$\Delta = final - initial$

Kinematics

$\vec{v}^*_{ave} = \frac{\Delta \vec{d}}{\Delta t}$ $\quad \vec{d}_f = \vec{d}_i + \vec{v}t$

$s_{ave} = \frac{\Delta d}{\Delta t}$

$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$

$\vec{v}_f = \vec{v}_i + \vec{a}t$

$\vec{v}_f^2 = \vec{v}_i^2 + 2\vec{a}\vec{d}$

$\Delta \vec{d} = \vec{v}_i t + \frac{1}{2}\vec{a}t^2$

$* \, a \, is \, Constant$

$\vec{d}^* = \frac{\vec{v}_i + \vec{v}_f}{2} t$ $\quad \vec{v}^*_{ave} = \frac{\vec{v}_f + \vec{v}_i}{2}$

$R^* = \frac{\vec{v}^2 sin2\theta}{g}$ Projectile Range*

$x_{int} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Dynamics

$\vec{F}_g = m\vec{g}$

$\Sigma \vec{F} = ma$

$\vec{F}_a - \vec{F}_f = ma$

$\vec{F}_f = \mu \vec{F}_N$

$\vec{F}_s = -k\Delta\vec{x}$

$U_s = \frac{1}{2}k\vec{x}^2$

Elastic Potential

Gravitation

$\overrightarrow{F_G} = \frac{GMm}{r^2}$ $\quad \vec{g} = \frac{GM}{r^2}$ $\quad E_G = -\frac{GMm}{r}$ $\quad E_p = E_G$

Equillibrium

$\tau = F_{\perp} d$ $\quad \tau_{ccw} = \tau_{cw}$

Momentum

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

$\vec{I} = \Delta\vec{p} = m\Delta\vec{v} = \vec{F}\Delta t = \vec{F}_{net} t$

$\Sigma \vec{p}_i = \Sigma \vec{p}_f$

$\vec{p}_{1i} + \vec{p}_{2i} = \vec{p}_{1f} + \vec{p}_{2f}$

$m_1\vec{v}_{1i} + m_2\vec{v}_{2i} = m_1\vec{v}_{1f} + m_2\vec{v}_{2f}$

Work, Energy and Power

$W = \vec{F}_{||}\vec{d}$ $\quad E_p = m\vec{g}h$ $\quad E_t = E_k + E_p$

$\Sigma E_i = \Sigma E_f$

$E_{ki} + E_{pi} = E_{kf} + E_{pf}$

$W = \Delta E$ $\quad E_k = \frac{1}{2}m\vec{v}^2$

$\Delta E_k + \Delta E_p = 0$

$\Delta E_k = -\Delta E_p$

$\frac{1}{2}m\vec{v}_i^2 + mgh_i = \frac{1}{2}m\vec{v}_f^2 + mgh_f$

$P = \frac{W}{t}$ $\quad P = \vec{F}\vec{v}$ $\quad e_{ff} = \frac{Work\ Out}{Work\ In}$

$E_{pi} + E_{ki} + \Delta E = E_{pf} + E_{kf}$

Waves and Optics

$\vec{v} = \frac{\lambda}{T}$ $\quad T = \frac{1}{f}$ $\quad n = \frac{\vec{C}}{\vec{v}}$ $\quad n_1 sin\theta = n_2 sin\theta$ $\quad sin\theta_c = \frac{1}{n}$ $\quad f' = f\left(\frac{\vec{v} \pm \vec{v}_o}{\vec{v} \pm \vec{v}_s}\right)$

$m = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$ $\quad \frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$

The focal length of a convex mirror or concave lens negative.