



Noether

EQUATION SHEET

Units, Conversions and Constants

Metric units

'n' = nano, 10^{-9} (1 nm = 10^{-9} m)
 'μ' = micro, 10^{-6} (1 μm = 10^{-6} m)
 'm' = milli, 10^{-3} (1 mm = 10^{-3} m)
 'k' = kilo, 10^3 (1 km = 10^3 m)
 'M' = Mega, 10^6 (1 Mm = 10^6 m)
 'G' = Giga, 10^9 (1 Gm = 10^9 m)

Conversions

1 meter = 3.28 ft.
 1 mile = 1.61 km
 1 lb. = 4.45 N

Constants

$G = 6.672 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$
 $m_e = 9.11 \times 10^{-31} \text{ kg}$
 $m_p = 1.67 \times 10^{-27} \text{ kg}$
 $q_e = q_p = 1.6 \times 10^{-19} \text{ C}$

Waves and Light

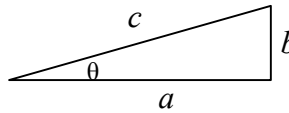
$T = 1 / f$ $v = \lambda f$ $v_{\text{sound}} = 331.4 \text{ m/s} + 0.6T$ $c = 3 \times 10^8 \text{ m/s}$
 $v = c/n$ $n_1 \sin \theta_1 = n_2 \sin \theta_2$ $1/f = 1/d_o + 1/d_i$

Motion 1D

$v_{\text{avg}} = \Delta x / \Delta t$ $\Delta x = x_{\text{final}} - x_{\text{initial}}$
 $a_{\text{avg}} = \Delta v / \Delta t$ $\Delta(\text{anything}) = \text{final value} - \text{initial value}$
 $\Delta x = v_0 t + \frac{1}{2} a t^2$ $g = -9.81 \text{ m/s}^2 \approx -10 \text{ m/s}^2$ (upward is positive direction)
 $\Delta v = a t$
 $v^2 = v_0^2 + 2a(\Delta x)$

Projectile Motion

$\sin(\theta) = b/c \rightarrow b = c \cdot \sin(\theta)$
 $\cos(\theta) = a/c \rightarrow a = c \cdot \cos(\theta)$
 $\tan(\theta) = b/a \rightarrow b = a \cdot \tan(\theta)$
 $c^2 = a^2 + b^2$



$\Delta x = v_x t$
 $\Delta y = v_{0y} t + \frac{1}{2} g t^2$ $g = -9.81 \text{ m/s}^2 \approx -10 \text{ m/s}^2$ (upward is positive direction)
 $v^2_{fy} = v^2_{0y} + 2g\Delta x$ Note: v_x does not change when neglecting air resistance

Force

$\Sigma \mathbf{F} = m\mathbf{a}$ \rightarrow $\Sigma F_x = m a_x$ $\mathbf{F}_g = m\mathbf{g}$
 $\Sigma F_y = m a_y$ $P = F/A$

Momentum

$\Sigma \mathbf{p}_i = \Sigma \mathbf{p}_f$ $\mathbf{p} = m\mathbf{v}$ $\Delta \mathbf{p} = \mathbf{F}\Delta t$