Equation Sheet

Equations of Motion

$$\Delta x = x_f - x_i \qquad \Delta x = \bar{v}t \qquad \bar{v} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i} \qquad a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$

Kinematic Equations

$$v_f = v_i + at \qquad \Delta x = \frac{v_f + v_i}{2}t \qquad x_f = x_i + v_i t + \frac{1}{2}at^2 \qquad {v_f}^2 = {v_i}^2 + 2a\Delta x$$

Forces

$$\Sigma\vec{F} = m\vec{a} \qquad F = \frac{Gm_1m_2}{r^2}$$
$$\vec{f_r} = \mu_s * \vec{F}_N \qquad \vec{f_r} = \mu_k * \vec{F}_N$$

Energy, Work, and Power

$$E_i = E_f \qquad E = KE + PE + PE_s$$
$$KE = \frac{1}{2}mv^2 \qquad PE = mgh \qquad PE_s = \frac{1}{2}kx^2$$
$$W = Fcos(\theta)d \qquad W_{ext} = E_f - E_i$$
$$W = KE_f - KE_i \qquad W = PE_f - PE_i \qquad W = PE_{s-f} - PE_{s-i}$$
$$\bar{P} = \frac{W}{t} \qquad \bar{P} = F\bar{v}$$

Momentum

$$\vec{p} = m\vec{v} \qquad \Sigma\vec{F} = \frac{\Delta\vec{p}}{\Delta t} \qquad \vec{J} = \vec{F}\Delta t = \Delta\vec{p}$$
$$m_A\vec{v}_A + m_B\vec{v}_B = m_A\vec{v}'_A + m_B\vec{v}'_B$$

Angular Variables

$$\ell = r\theta \qquad \omega = \frac{\Delta\theta}{\Delta t} \qquad \alpha = \frac{\Delta\omega}{\Delta t}$$
$$v = r\omega \qquad a_c = r\alpha \qquad a_c = \frac{v^2}{r} = r\omega^2$$

Rotational Kinematics

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

Torque

$$\sum\tau = rFsin(\theta) \qquad \sum\tau = I\alpha \qquad I = \sum_i m_i r_i^2$$
$$L_f = L_i \qquad L = I\omega \qquad KE_r = \frac{1}{2}I\omega^2$$
$$W = \tau\theta \qquad P = \tau\omega$$

Equation Sheet

Pendulums

$$T = 2\pi\sqrt{\frac{L}{g}} \quad T = 2\pi\sqrt{\frac{I}{mgL}}$$

Electricity and Magnetism

$$F = k\frac{Q_1 Q_2}{r^2} \qquad \vec{E} = \frac{\vec{F}}{q} \qquad \vec{E} = \frac{q}{\epsilon_0 A}$$

$$V = IR \qquad \Delta V = \frac{W}{q} \qquad V = \frac{PE}{q}$$

$$R_{series} = R_1 + R_2 + R_n \qquad \frac{1}{R_{parallel}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_n}$$

$$P = IV \qquad P = I^2 R$$

$$F = Ilsin(\theta)B \qquad F = qvsin(\theta)B$$

Relativity

$$E = m_o c^2 \quad t = \frac{t_0}{\sqrt{1-\frac{v^2}{c^2}}} \quad L = L_0\sqrt{1-\frac{v^2}{c^2}}$$

Constants

$1N = 1\frac{kgm}{s^2}$	$G = 6.67 * 10^{-11}\frac{m^3}{kgs^2}$	$g = 9.81\frac{m}{s^2}$
$1J(joule) = 1\frac{kgm^2}{s^2}$	$1W(watt) = 1\frac{J}{s}$	2π radians $= 360°$
$1Ampere = 1\frac{C}{s}$	$1Volt = 1\frac{J}{C}$	$k = 8.988 * 10^9\frac{Nm^2}{C^2}$
$c = 3 * 10^8\frac{m}{s}$	$m_{electron} = 9.109 * 10^-31kg$	$q_{electron} = -1.602 * 10^-19C$
$1T(Tesla) = 1\frac{kg}{As^2}$	$m_{proton} = 1.673 * 10^-27kg$	$q_{proton} = 1.602 * 10^-19C$
$1km = 1000m$	$1m = 100cm$	$1mile = 1609.34m$
$1mm = 1 * 10^{-3}m$	$1\mu m = 1 * 10^{-6}m$	$1nm = 1 * 10^{-9}m$

Assorted Maths

Trigonometric Functions

$$sin(\theta) = \frac{opp.}{hyp.} \quad cos(\theta) = \frac{adj.}{hyp.} \quad tan(\theta) = \frac{opp.}{adj.}$$

The Quadratic Equation

$$0 = Ax^2 + Bx + C \qquad x = \frac{-B \pm \sqrt{B^2-4AC}}{2A}$$