

Gravitation

Notation	Equation
Gravitational Force's Magnitude	$F = G \frac{m_1 m_2}{r^2}$
Gravitational Constant G	$G = 6,67 * 10^{-11} \frac{Nm}{kg^2} = 6,67 * 10^{-11} \frac{m^3}{kg * s^2}$
Principle of Superposition	$F_{1,\vec{net}} = F_{1,2} + F_{1,3} + \dots + F_{1,n} = \sum_{i=2}^n F_{1,i}$
P.o.S on a Extended Real Object	$\vec{F}_1 = \int d\vec{F}$
Newton's Second Law	$F = ma_g$
Gravitational Acceleration	$a_g = \frac{GM}{r^2}$
Newton's Second Law for Forces along r axis	$F_N - ma_g = -m(\omega^2 R)$
Free-Fall Acceleration (Near Earth's Surface)	$g = a_g - \omega^2 R$
Gravitational Force Inside Earth	$F = \frac{GmM}{R^3} r$
Gravitational Potential Energy 2-particles	$U = -\frac{GMm}{r}$
Gravitational Potential Energy mul-particles	$U = -(\frac{Gm_1 m_2}{r_{12}} + \frac{Gm_1 m_3}{r_{13}} + \frac{Gm_2 m_3}{r_{23}} \dots)$
Change Gravitational Potential Energy (Path Indep.)	$\Delta U = U_f - U_i = -W$
Escape Speed	$v = \sqrt{\frac{2GM}{R}}$