

# 1 Solar System Dynamics

**NOTE:**

**field:** Give the equation for the attraction between two bodies Sun and Earth, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$F = G \frac{M_{Sun} M_{Earth}}{r^2}$$

,

$N$

**NOTE:**

**field:** Give the Vis-Viva equation, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$\frac{V^2}{2} = \frac{\mu}{r} - \frac{\mu}{2a}$$

,

$$\frac{m^2}{s^2}$$

**NOTE:**

**field:** Give the equation for orbital period, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$T = 2\pi \sqrt{\frac{r^3}{\mu}}$$

,

$s$

**NOTE:**

**field:** Give the equation for escape velocity  $V_{esc}$ , commaseparate the equation with its units. (using frac if necessary).

**field:**

$$V_{esc} = \sqrt{\frac{2\mu}{r}}$$

,

$\frac{m}{s}$

**NOTE:**

**field:** Give the Hill equation for Jupiter and the Sun, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$r_{hill} = a \left( \frac{m_{Jupiter}}{3(m_{Sun} + m_{Jupiter})} \right)^{\frac{1}{3}}$$

,

$m$

## 2 Minor Bodies and Comets

**NOTE:**

**field:** Give the equation for the minimum radius of a spherical body, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$R_{min} = \sqrt{\frac{2S}{\pi G \rho^2}}$$

,

$m$

**NOTE:**

**field:** Give the equation to compute the gravitational constant of a planet, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$\mu = MG$$

,

$$\frac{km^3}{s^2}$$

**NOTE:**

**field:** Give the equation to compute the spherical harmonics of Earth due to the Moon, commaseparate the equation with its units. (using frac if necessary).

**field:**

$$U = \frac{\mu_{Moon}}{R_{Earth-Moon}} \sum_{n=2}^{\infty} \left( \frac{R_{Earth}}{R_{Earth-Moon}} \right)^n P_n \cos \phi$$

,

$$\frac{m^2}{s^2}$$

**NOTE:**

**field:** Give the equation to compute the legendre polynomials, ommit units.

**field:**

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$$

,

$$\frac{m^2}{s^2}$$

**NOTE:**

**field:** Give the 0th,1st and 2nd legendre polynomials comma separated, ommit units.

**field:**

$$P_0(x) = 1$$

,

$$P_1(x) = x$$

,

$$P_2(x) = \frac{1}{2}(3x^2 - 1)$$