Important Attractive Force Potentials Formulas PDF

Formulas
Examples
with Units

List of 13
Important Attractive Force Potentials Formulas

1) Attractive Force Potentials per unit Mass for Moon Formula

Evaluate Formula

Formula

$$V_M = \frac{f \cdot M}{r_{S/MX}}$$

Example with Units

$$5.7E{+}17 = \frac{2 \cdot 7.35E22\,\text{kg}}{256\,\text{km}}$$

2) Attractive Force Potentials per unit Mass for Moon given Harmonic Polynomial Expansion Formula

Evaluate Formula

Formula

$$V_M = \left(f \cdot M\right) \cdot \left(\frac{R_M^{\,2}}{r_m^{\,3}}\right) \cdot P_M$$

Example with Units

$$5.1E{+}17 = \left(2 \cdot 7.35E22\,\text{kg}\right) \cdot \left(\frac{6371\,\text{km}^{\,2}}{384467\,\text{km}^{\,3}}\right) \cdot 4.9E{+}6$$

3) Attractive Force Potentials per unit Mass for Sun Formula

Evaluate Formula

Formula

$$V_s = \frac{f \cdot M_{sun}}{r_{S/MX}}$$

Example with Units

$$1.6E{+}25 = \frac{2 \cdot 1.989E30\,\text{kg}}{256\,\text{km}}$$

4) Attractive Force Potentials per unit Mass for Sun given Harmonic Polynomial Expansion Formula

Evaluate Formula

Formula

$$V_s = f \cdot M_{sun} \cdot \left(\frac{R_M^{\,2}}{r_s^{\,3}}\right) \cdot P_s$$

Example with Units

$$1.4E{+}25 = 2 \cdot 1.989E30\,\text{kg} \cdot \left(\frac{6371\,\text{km}^{\,2}}{150000000\,\text{km}^{\,3}}\right) \cdot 3E14$$

5) Distance from Center of Earth to Center of Moon given Attractive Force Potentials Formula

Evaluate Formula

Formula

$$r_m = \left(R_M^2 \cdot f \cdot [Moon\text{-}M] \cdot \frac{P_M}{V_M} \right)^{\frac{1}{3}}$$

Example with Units

$$371480.2511\,\text{km} = \left(6371\,\text{km}^2 \cdot 2 \cdot 7.3E{+}22\,\text{kg} \cdot \frac{4.9E{+}6}{5.7E17} \right)^{\frac{1}{3}}$$

6) Mass of Moon given Attractive Force Potentials Formula

Evaluate Formula

Formula

$$M = \frac{V_M \cdot r_{S/MX}}{f}$$

Example with Units

$$7.3E{+}22\,\text{kg} = \frac{5.7E17 \cdot 256\,\text{km}}{2}$$

7) Mass of Moon given Attractive Force Potentials with Harmonic Polynomial Expansion Formula

Evaluate Formula

Formula

$$M = \frac{V_M \cdot r_m^3}{[Earth\text{-}R]^2 \cdot f \cdot P_M}$$

Example with Units

$$8.1E{+}22\,\text{kg} = \frac{5.7E17 \cdot 384467\,\text{km}^3}{6371.0088\,\text{km}^2 \cdot 2 \cdot 4.9E{+}6}$$

8) Mass of Sun given Attractive Force Potentials Formula

Evaluate Formula

Formula

$$M_{sun} = \frac{V_s \cdot r_{S/MX}}{f}$$

Example with Units

$$2E{+}30\,\text{kg} = \frac{1.6E25 \cdot 256\,\text{km}}{2}$$

9) Mass of Sun given Attractive Force Potentials with Harmonic Polynomial Expansion Formula

Evaluate Formula

Formula

$$M_{sun} = \frac{V_s \cdot r_s^3}{[Earth\text{-}R]^2 \cdot f \cdot P_s}$$

Example with Units

$$2.2E{+}30\,\text{kg} = \frac{1.6E25 \cdot 150000000\,\text{km}^3}{6371.0088\,\text{km}^2 \cdot 2 \cdot 3E14}$$

10) Mean Radius of Earth given Attractive Force Potentials per Unit Mass for Moon Formula

Evaluate Formula

Formula

$$R_M = \sqrt{\frac{V_M \cdot r_m^3}{f \cdot M \cdot P_M}}$$

Example with Units

$$6706.0892\,\text{km} = \sqrt{\frac{5.7E17 \cdot 384467\,\text{km}^3}{2 \cdot 7.35E22\,\text{kg} \cdot 4.9E{+}6}}$$

11) Mean Radius of Earth given Attractive Force Potentials per Unit Mass for Sun Formula

Evaluate Formula

Formula

$$R_M = \sqrt{\frac{V_s \cdot r_s^3}{f \cdot M_{sun} \cdot P_s}}$$

Example with Units

$$6726.7279\,\text{km} = \sqrt{\frac{1.6\text{E}25 \cdot 150000000\,\text{km}^3}{2 \cdot 1.989\text{E}30\,\text{kg} \cdot 3\text{E}14}}$$

12) Moon's Tide-generating Attractive Force Potential Formula

Evaluate Formula

Formula

$$V_M = f \cdot M \cdot \left(\left(\frac{1}{r_{S/MX}}\right) - \left(\frac{1}{r_m}\right) - \left([\text{Earth-R}] \cdot \frac{\cos\left(\theta_{m/s}\right)}{r_m^2}\right)\right)$$

Example with Units

$$5.7\text{E}{+}17 = 2 \cdot 7.35\text{E}22\,\text{kg} \cdot \left(\left(\frac{1}{256\,\text{km}}\right) - \left(\frac{1}{384467\,\text{km}}\right) - \left(6371.0088\,\text{km} \cdot \frac{\cos\left(12.5°\right)}{384467\,\text{km}^2}\right)\right)$$

13) Tide-generating Attractive Force Potential for Sun Formula

Evaluate Formula

Formula

$$V_s = \left(f \cdot M_{sun}\right) \cdot \left(\left(\frac{1}{r_{S/MX}}\right) - \left(\frac{1}{r_s}\right) - \left(R_M \cdot \frac{\cos\left(\theta_{m/s}\right)}{r_s^2}\right)\right)$$

Example with Units

$$1.6\text{E}{+}25 = \left(2 \cdot 1.989\text{E}30\,\text{kg}\right) \cdot \left(\left(\frac{1}{256\,\text{km}}\right) - \left(\frac{1}{150000000\,\text{km}}\right) - \left(6371\,\text{km} \cdot \frac{\cos\left(12.5°\right)}{150000000\,\text{km}^2}\right)\right)$$

Variables used in list of Attractive Force Potentials Formulas above

- **f** Universal Constant
- **M** Mass of the Moon *(Kilogram)*
- M_{sun} Mass of the Sun *(Kilogram)*
- P_M Harmonic Polynomial Expansion Terms for Moon
- P_s Harmonic Polynomial Expansion Terms for Sun
- r_m Distance from center of Earth to center of Moon *(Kilometer)*
- R_M Mean Radius of the Earth *(Kilometer)*
- r_s Distance *(Kilometer)*
- $r_{S/MX}$ Distance of Point *(Kilometer)*
- V_M Attractive Force Potentials for Moon
- V_s Attractive Force Potentials for Sun
- $\theta_{m/s}$ Angle made by the Distance of Point *(Degree)*

Constants, Functions, Measurements used in list of Attractive Force Potentials Formulas above

- constant(s): **[Earth-R]**, 6371.0088
  Earth mean radius
- constant(s): **[Moon-M]**, 7.3458E+22
  Moon mass
- Functions: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Kilometer (km)
  Length Unit Conversion
- Measurement: **Weight** in Kilogram (kg)
  Weight Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion

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