

Gravitation

Physics

Newton's law, gravitational fields, and orbital motion.

The gravitational force between two masses is proportional to their product and inversely proportional to the square of their separation.

$$F = GMm/r^2 \cdot g = GM/r^2 \cdot T^2 \cdot r^3$$

Double the separation

Force falls to 1/4

Orbital speed

$$v = \sqrt{GM/r}$$

From equating gravity and centripetal force.

Kepler's third law

$$T^2 = 4\pi^2 r^3 / GM$$

THE COMMON MISTAKE

✗ **Measuring r from the surface**

✓ **From the centre of mass**

Gravitational field equations use distance from the centre. For a surface problem, r is the planet's radius.

Gravitational potential is negative and zero at infinity. Escape velocity comes from setting total energy to zero.