

$$F = \frac{mv^2}{R} \quad F = \frac{m4\pi^2 R}{T^2} \quad F = \frac{m2\pi v}{T} \quad F = m4\pi^2 Rf^2$$

$$a = \frac{v^2}{R} \quad a = \frac{4\pi^2 R}{T^2} \quad a = \frac{2\pi v}{T} \quad a = 4\pi^2 Rf^2$$

Gravity – planets in orbits

$$v = \frac{2\pi R}{T} \quad T = \frac{2\pi R}{v} \quad R = \frac{vT}{2\pi}$$

$$F = \frac{GMm}{R^2} \quad g = \frac{GM}{R^2}, \quad a = \frac{GM}{R^2}, \quad g = \frac{v^2}{R}, \quad a = \frac{v^2}{R}$$

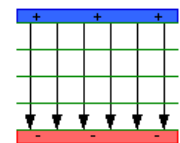
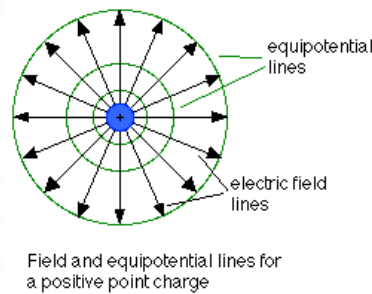
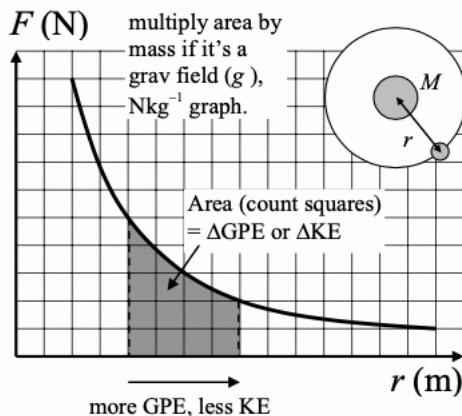
$$F = \frac{mv^2}{R} = \frac{GMm}{R^2} \Rightarrow v = \sqrt{\frac{GM}{R}}, \quad R = \frac{GM}{v^2}, \quad M = \frac{v^2 R}{G}$$

$$F = \frac{m4\pi^2 R}{T^2} = \frac{GMm}{R^2} \Rightarrow \frac{R^3}{T^2} = \frac{GM}{4\pi^2} = \text{constant} - \text{Kepler's}$$

$$R = \sqrt[3]{\frac{GMT^2}{4\pi^2}} \quad T = \sqrt{\frac{4\pi^2 R^3}{GM}} \quad T = \sqrt{\frac{4\pi^2 R}{g}} \quad M = \frac{4\pi^2 R^3}{GT^2} \quad v = \sqrt{\frac{2\pi GM}{T}}$$

For moving altitude of satellite or questions using kepler's ratio

$$\frac{T_1}{T_2} = \sqrt[3]{\left(\frac{R_1}{R_2}\right)^3} \quad \frac{R_1}{R_2} = \sqrt[3]{\left(\frac{T_1}{T_2}\right)^2}$$



Field and equipotential lines for a set of parallel plates

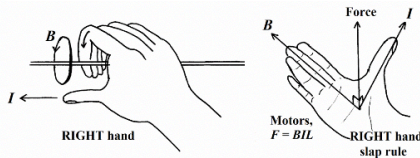
Geostationary (geosynchronous) orbit: Period T of satellite = 24hrs

Explain the purpose of the split-ring commutator in the DC motor

- Change the direction of current every half turn
- Changes the direction of force every half turn on the side (context)
- Maintains the direction of torque in the coil in (context) direction.
- Maintains electrical contact without tangling during rotation

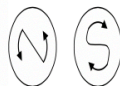
3 ways to increase the strength of the magnetic field of a solenoid

- Use a ferro-magnetic core
- Increase the current through the solenoid
- Increase the number of turns around the iron core



$$F = nBIl \quad \text{OR} \quad F = nBIl \sin \theta$$

Figuring out N/S on solenoids: RHGR or



Force on charge: $F = qvB$

Split ring commutator reverses current every half turn to swap direction of force and maintain continuous torque in one direction.

- current reverses every half cycle.
- when current reverses, so do the directions of the force couple.
- the loop's momentum will carry it into a position where the reversed forces will cont. the rotation.

