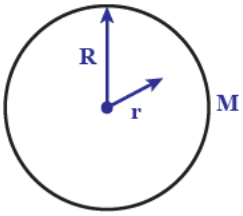
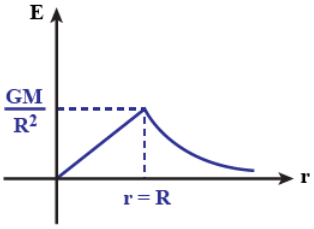
$$E = \frac{GMr}{R^3}$$



- Field at the center of solid sphere is zero.
- Graph between E and distance $'r'$ from center of sphere is



Question 10:

Potential due to point mass and system of point masses

Solution:

Step 1: calculation of potential due to point mass

- Potential due to point mass is given by

$$V = -\frac{GM}{r} \qquad (r \text{ is distance from mass})$$

Step 2: Calculation of potential due to system of point masses

- If more than one mass is present, the potential at a point is the sum of potential due to individual mass.

$$V_{system} = V_1 + V_2 + V_3 + \cdots$$

Points to remember: -

Potential energy is given by

$$U = mV$$

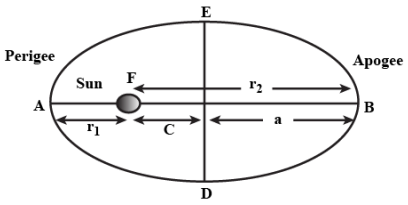
Question 11:

Potential due to ring on its axis

Solution:

Solution:

Step 1: Calculation of minimum and maximum velocity in elliptical orbits.



- Velocity of planet in elliptical orbit is minimum at apogee

$$V_{min} = \sqrt{\frac{GM}{a}\left(\frac{1-e}{1+e}\right)}$$

- Velocity of planet in elliptical orbit is maximum at perigee

$$V_{max} = \sqrt{\frac{GM}{a}\left(\frac{1-e}{1+e}\right)}$$

$$V_{min}(1+e) = V_{max}(1-e)$$

Step 2: Calculation of total energy in elliptical orbit

- Total energy of a satellite revolving in elliptical orbit is constant

$$TE = -\frac{GMm_p}{2a}$$ (a is semi major axis)

m_p is mass of planet

Points to remember: -

- In elliptical orbit mechanical energy and angular momentum is conserved.