

Gravity and Gravitation

Gravitational potential

Gravitational potential at a point is equal to the change in potential energy per unit mass, as the mass is brought from the reference point to the given point.

Gravitational field

It is assumed that a body say A, creates a gravitational field in the space around it. The field has its own existence and has energy and momentum. When another body B is placed in gravitational field of a body, this field exerts a force on it. The direction and intensity of the field is defined in terms of the force it exerts on a body placed in it.

The intensity of gravitational field vector E at a point is defined by the equation

$$\text{vector } E = \text{force vector } F / \text{mass}$$

where F is the force vector exerted by the field on a body of mass m placed in the field. The intensity of gravitational field is abbreviated as gravitational field. Its SI unit is N/kg .

By the way they are defined, intensity of gravitational field and acceleration due to gravity have equal magnitudes and directions, but they are two separate physical quantities.

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Obtaining gravitational potential from gravitational field: If intensity of gravitational field E is defined in term of r the distance from the body exerting the gravitational force, its potential can be obtained by integrating e with respect to r ($\int E dr$).

If the potential is known, then its partial derivatives with respect to x , y , and z can be taken and they can be combined to get E , the intensity of gravitation field.

$$E = iE_x + jE_y + kE_z$$