

Answer on Question #44393 – Physics – Mechanics | Kinematics | Dynamics

Question.

An astronomical object has its mass 4 times the mass of earth and radius half of the radius of earth. If acceleration due to gravity at earth is g , find its value at the surface of the astronomical object.

$$M = 4M_E$$

$$R = 0.5R_E$$

$$a_E = g$$

$$a = ?$$

Solution.

As we know from the gravitational law:

$$a = G \frac{M}{R^2}, \text{ where}$$

a is the acceleration at the surface of the astronomical object;

G is the gravitational constant;

M is the mass of the object;

R is the radius of the object.

For Earth we have the following:

$$g = G \frac{M_E}{R_E^2}$$

Therefore,

$$a = G \frac{M}{R^2} = a = G \frac{4M_E}{(0.5R_E)^2} = 16G \frac{M_E}{R_E^2} = 16g$$

Answer.

$$a = 16g$$