Answer on Question #64001, Physics / Mechanics | Relativity

Question:

A satellite with a mass of 2273 kg is at an altitude of 42873 km above the surface of Saturn. What is the strength of the gravitational force on the satellite?

Solution:

Gravitational force between two bodies may be calculated according to this formula:

$$F_{gr} = G \frac{m_1 m_2}{R^2},$$

where G — gravitational constant (6.674×10^{-11} m³ kg⁻¹ s⁻²),
m_1 and m_2 — masses of the bodies,
R — distance between its centres.

In our case we must take into account Saturn's radius (58232 km) and mass ($5.683 \cdot 10^{26}$ kg).

So $R = 42873 + 58232\ km = 101105\ km \cong 1.011 \cdot 10^8\ m$

And thus $F_{gr} = 6.674 \times 10^{-11} \frac{2273 \cdot 5.683 \cdot 10^{26}}{(1.011 \cdot 10^8)^2} = 8434\ N$

Answer:

$8434\ N$