

Answer on Question #61598-Physics-Other

A satellite of mass $2.00 \times 10^4 \text{ kg}$ is placed in orbit around Jupiter. The mass of Jupiter is $1.90 \times 10^{27} \text{ kg}$. The distance between the satellite and the center of Jupiter is $7.24 \times 10^7 \text{ m}$.

- a) If the mass of Io were to suddenly double, by what amount would the force of gravitational attraction change? (Do not actually calculate the force of attraction; just determine how much more or less the force of gravity would change.)
- b) If the distance between Jupiter and Callisto doubles ($2R_o$), by what amount would the force of gravitational attraction (F_g) change?

Solution

- a) Newton's law of universal gravitation:

$$F_{12} = G \frac{m_1 m_2}{r_{12}^2}; F \sim m.$$

So, if the mass of Io were to suddenly double the force of attraction will be double too.

- b)

$$F \sim \frac{1}{R^2}$$

So, if the distance between Jupiter and Callisto double the force of gravitational attraction reduced four times.

Answer: a) Force will increase twice; b) Force will be reduced four times.