Answer on Question 57628, Physics – Mechanics | Relativity

Question:

If the Moon were twice as massive, how would the attractive force of the Moon on the Earth change? How about the force of the Earth on the Moon?

Solution:

Let's write the Newton's Law of Universal Gravitation:

$$F = G\frac{M_{Earth}M_{Moon}}{r^2},$$

here, F is the attractive force of the Moon on the Earth, G is the universal gravitational constant, M_{Earth} is the mass of the Earth, M_{Moon} is the mass of the Moon, r is the distance between centers of the Earth and the Moon.

If the Moon were twice as massive, we get:

$$F_{new} = G\frac{M_{Earth}2M_{Moon}}{r^2} = 2G\frac{M_{Earth}M_{Moon}}{r^2} = 2F.$$

As we can see, the attractive force of the Moon on the Earth would be twice as much. The force of the Earth on the Moon is exactly the same as the force of the Moon on the Earth – it follows from the Newton's Law of Universal Gravitation.

Answer:

The attractive force of the Moon on the Earth would be twice larger. The force of the Earth on the Moon is exactly the same as the force of the Moon on the Earth.