

Newton's Law of Gravitation

Newton concluded that the gravitational force between any two masses was proportional to the masses (make the masses bigger and the gravitational force between them will get bigger) and inversely proportional to the square of the distance between the center of mass of the two bodies. The proportionality constant is called the *universal gravitational constant* "G," and the magnitude of the overall expression as an equality is:

$$F_g = G \frac{m_1 m_2}{r^2}$$

1.)

Kepler's Laws

Kepler's First: All planets move in elliptical orbits with the Sun at one of the focal points. (Law of orbits)

Kepler's Second: A line drawn from the Sun to any planet sweeps out equal areas in equal time intervals. (Law of areas.)

Kepler's Third: The square of the orbital period of any planet is proportional to the cube of the average distance from the planet to the Sun. (Law of period.)

Note: Although there has since been theoretical confirmation of Kepler's Laws, he actually produced them using data accumulated by the astronomer Tycho Brahe. When Brahe died, Kepler absconded with Brahe's data and, after years of messing, came up with his final observations (the Laws).

2.)