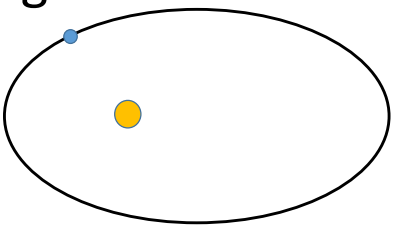
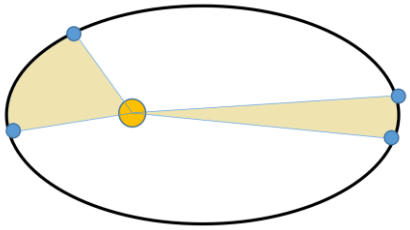
Newton's law of universal gravitation

Kepler's laws:

1st law: Planets move around the sun in elliptical orbits with the sun at one focal point.

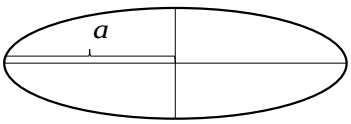


2d law: The radius vector drawn from the Sun to a planet sweeps out equal areas in equal time intervals.

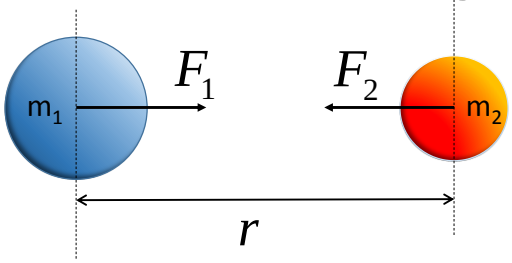


3d law: The square of the orbital period of any planet is proportional to the cube of the semimajor axis of the elliptical orbit

$$T^2 \sim a^3$$



Newton's law of universal gravitation



$$F_1 = F_2 = G.\frac{m_1.m_2}{r^2}$$

$$G = 6{,}67.10^{-11}\ \frac{N.m^2}{kg^2}$$

Newton's law of universal gravitation

Example: Calculate the force between the earth and the moon at the moment they are closest to each other: 363295km.

$$G : m_{earth} = 5{,}98.10^{24}\,kg; m_{moon} = 7{,}36.10^{22}\,kg; r = 363295km; F : F\,?$$

$$S : F_1 = F_2 = G.\frac{m_1.m_2}{r^2}$$

$$F_1 = F_2 = 6{,}67.10^{-11}\,\frac{N.m^2}{kg^2}.\frac{5{,}98.10^{24}\,kg.7{,}36.10^{22}\,kg}{\left(363295.10^3\,m\right)^2}$$

$$F_1 = F_2 = 2{,}22.10^{22}\,N$$