


- The orbital motion of all celestial bodies in the universe are governed by gravitational force.
- Many orbits can be approximated as a class of orbit having the following characteristics:
 - A small mass m orbits a much larger mass M .
 - The system is isolated from other masses.

Kepler's Laws of Planetary Motion

- Tycho Brahe (Danish)
 - Made accurate and comprehensive astronomical observations.



Tycho Brahe (public domain)

- Johannes Kepler (German)
 - Worked with Brahe and devised laws that describe the motion of planets after careful study (over some 20 years) of Brahe's data.

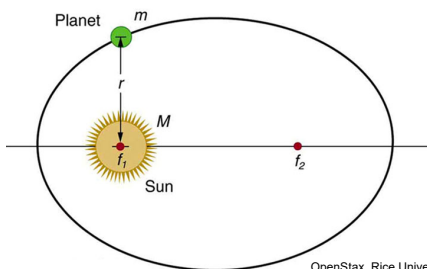


Johannes Kepler (public domain)



Kepler's First Law

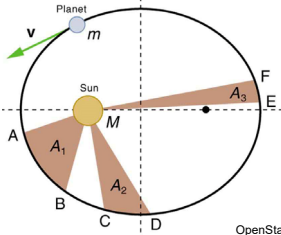
- The orbit of each planet about the Sun is an ellipse with the Sun at one focus.



OpenStax, Rice University (CC BY 4.0)

Kepler's Second Law

- Each planet moves so that an imaginary line drawn from the Sun to the planet sweeps out equal areas in equal times.



Kepler's Third Law

- The ratio of the squares of the periods of any two planets about the Sun is equal to the ratio of the cubes of their average distances from the Sun.

$$\frac{T_1^2}{T_2^2} = \frac{r_1^3}{r_2^3}$$
