Laws

Kepler's Three Laws of Planetary Motion

1. Orbits are elliptical, not circular. The sum of the distance from the two focii to a point on the ellipse is constant. The sun is at one focus and the other is empty. Eccentricity is equal to the distance between focii divided by the length of the long axis of ellipse. An eccentricity of 0 is a circle and 1 is a line.
2. The line that connects the planet to the sun sweeps out equal areas in equal time. Planets go faster when they are near the sun.
3. $p^2=a^3$ where p is the siderial period of the object and a is the semimajor axis. For it to be equal, p must be in years and a must be in AU, otherwise, it is proportional.

Newton's Laws of Motion

1. A body in motion tends to stay in motion unless acted upon by another force; a body at rest tends to stay at rest unless acted upon a by another force.
2. F=ma. Acceleration is the change of velocity.
3. For every action, there is an equal and opposite reaction. $F_1=F_2$