

Lab 3 – Kepler's Laws of Planetary Motion

ASTR 1010

Name:

Overview

In this activity you will investigate Kepler's three laws of planetary motion using the planets in the Solar System. You will also calculate orbital information about a comet.

Objectives

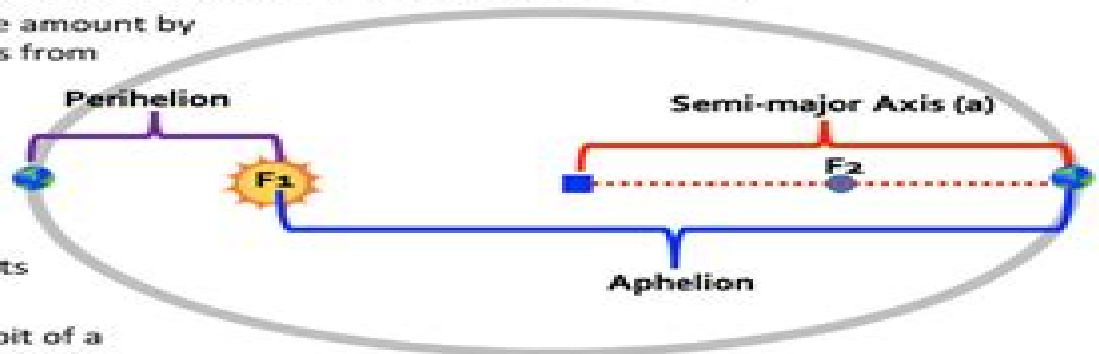
After completing this activity students will be able to:

- Describe how eccentricity influences the shape of an orbit.
- Investigate the orbital parameters of planets in the Solar System.
- Calculate the orbital periods of bodies in the Solar System.

Definitions

Here are some terms from lecture that we will be using today in lab:

- **Kepler's First Law** – the orbit of each planet is an ellipse with the Sun at one focus.
- **Kepler's Second Law** – a line joining the planet and the Sun sweeps out equal areas during equal intervals of time $\rightarrow$ equal area = equal time.
- **Kepler's Third Law** – The square of the orbital period of a planet (P) in years is directly proportional to the cube of the semimajor axis (a) in AU of its orbit $\rightarrow P^2 = a^3$
- **Eccentricity (e)** - measure of the amount by which an elliptical orbit deviates from a circle (e=0 is a perfect circle).
- **Semi-major axis (a)** - half of the major-axis length of an ellipse or elliptical orbit. Often given in units of AU or km. Approximately the same as the distance from the Sun for planets in the Solar System.
- **Perihelion** – the point in the orbit of a planet, asteroid, or comet at which it is closest to the Sun.
- **Aphelion** - the point in the orbit of a planet, asteroid, or comet at which it is furthest from the Sun.
- **Astronomical Unit (AU)** – mean distance between the Sun and the Earth. $1 \text{ AU} = 1.5 \times 10^8 \text{ km}$



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A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the name Edward Shevick.

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