Wikipedia – In astronomy, **Kepler's laws of planetary motion** are three scientific laws describing orbital motion, each giving a description of the motion of planets around the Sun.
Kepler's laws are:
1. The orbit of every planet is an ellipse with the Sun at one of the two foci.
2. A line joining a planet and the Sun sweeps out equal areas during equal intervals of time.[1]
3. The square of the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit.

The laws are named after German astronomer Johannes Kepler (1571 - 1630), who proposed them in the early 1600s. Kepler was able to summarize the carefully collected data of his mentor - Tycho Brahe - with three statements that described the motion of planets in a sun-centered solar system. Kepler's efforts to explain the underlying reasons for such motions are no longer accepted; nonetheless, the actual laws themselves are still considered an accurate description of the motion of any planet and any satellite.
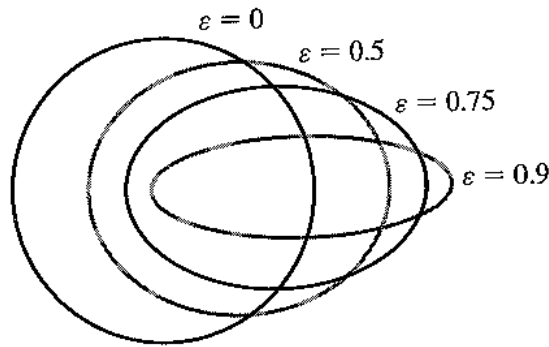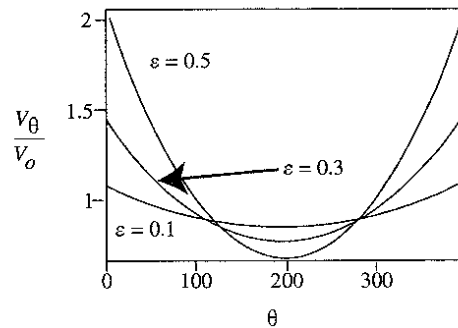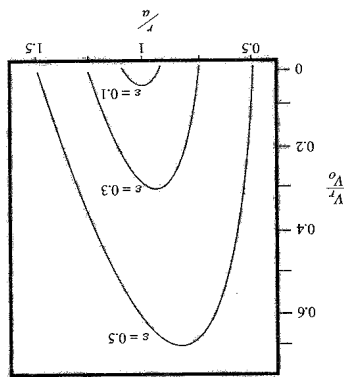From Goldstein, Poole, & Safko, Classical Mechanics 3rd Edition

FIGURE 3.14   Ellipses with the same major axes and eccentricities from 0.0 to 0.9.

FIGURE 3.16   Normalized radial velocity, v_r, versus r for three values of the eccentr...

Normalized orbital velocity, v_θ, versus θ for three values