

Kepler's "Laws"

- 1. (The) planets describe elliptical trajectories about the Sun (or central body) at a focus**
- 2. The radius vectors of (the) planets sweep out equal areas in equal times about the Sun (or central body)**
- 3. The periods of (the) planets are in sesquialternate proportion to their mean distances from the Sun (or central body)**
- 4. The distances of (the) planets from the Sun (or central body) vary as $a(1 + e \cos E)$, where a is the mean distance, e is the eccentricity, and E is the "eccentric anomaly"**
- 5. The trajectories defined by (the) planets are confined to single planes through the Sun (or central body) at a fixed inclination to the plane of the ecliptic**

Keplerian Motion: Projectability

At least to high approximation, the five planets move along ellipses, sweeping out equal areas in equal times with respect to the (true) Sun located at a focus common to all, on planes passing through the Sun at fixed angles of inclination, in periods proportional to the $3/2$ power of their mean distances from the Sun.

Questions about this group of generalizations:

1. What grounds were there for extending – i.e. projecting – each of the generalizations beyond the five planets to support claims about:
 - a. Any (“possible”) body orbiting the Sun?
 - b. Any body engaged in celestial orbital motion – e.g. Moon, satellites of planets?
 - c. Any celestial body moving within our planetary system – e.g. comets?
2. What grounds were there for concluding that the specific statement of each generalization was properly suited for any such projection?
3. What, if any, further qualifications – e.g. tacit *ceteris paribus* conditions – needed to be noted with each generalization before projecting it?