

6. (14 points) What is retrograde motion? How is it explained in a geocentric model of the Solar System? How is it explained in a heliocentric model of the Solar System?

(backwards)

Retrograde motion is the apparent westward motion of an outer planet when it is near opposition.

In a geocentric model it can be explained by having the planet move on an epicycle centered on the regular planetary orbit.

In a heliocentric model it naturally occurs whenever an inner planet (moving more quickly) catches up and passes an outer planet.

7. (14 points) A planet goes around the Sun in 30.0 years with an orbital eccentricity of 0.0500. What is the closest distance it can have from the Sun? You can express your answer in AUs or km.

$$p = 30 \text{ years}$$

$$e = 0.0500$$

$$p^2 = a^3$$

$$(30)^2 = a^3 \implies a = 9.65 \text{ AU}$$

$$d_p = a(1 - e)$$

$$d_p = 9.65(1 - 0.0500) = 9.17 \text{ AU}$$

$$= 1.38 \times 10^9 \text{ km}$$