1. For the case of a superior planet, derive from first principles the relationship between the planet’s synodic period (as seen from the Earth) and its sidereal period.

2. Assuming circular orbits, derive methods — one for superior planets and one for inferior planets — for determining the distances of the planets from the Sun, in astronomical units, given the information available to Copernicus: synodic periods and dates of orbital configurations. Good configurations to try would be those involving right angles: greatest elongation for inferior planets and quadrature for superior planets.

The astronomical unit is defined to be the distance from the Sun to the Earth. Therefore, you are being asked to find the relative distances between the planets. In effect, Copernicus was able to build a scale model of the solar system, but he did not know the scale.

3. Problem 1.5

4. Problem 1.6

5. Problem 1.7