

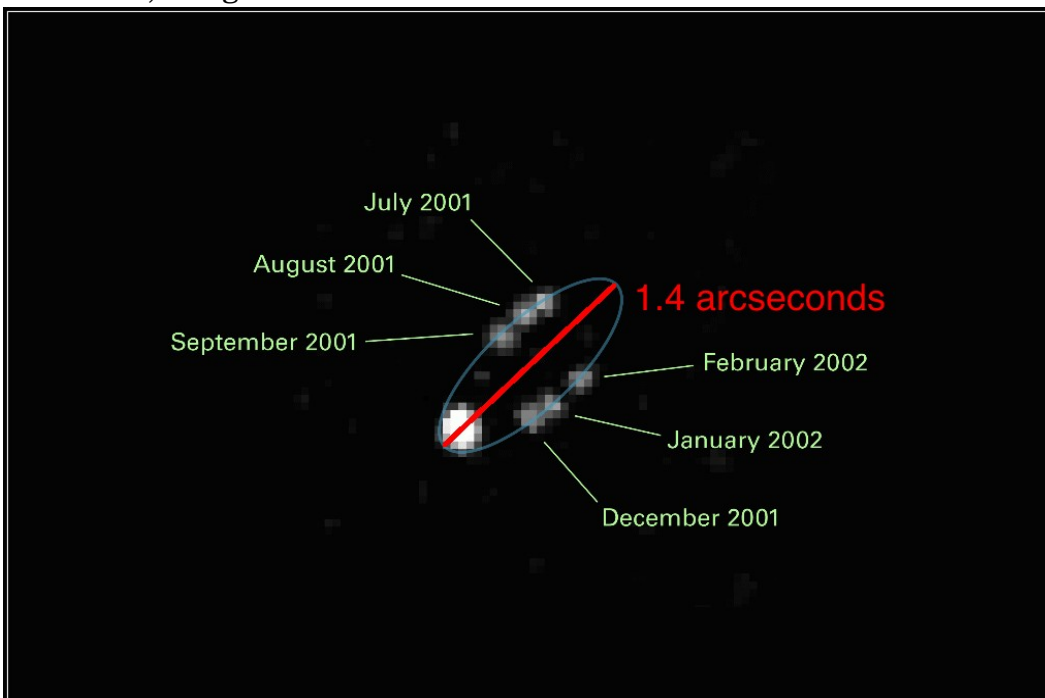
ASTR310, Homework Assignment 4

Due: Friday October 24th 5:00PM

Late Penalty: -50% if submitted by 5 PM Oct 27, -100% after.

Where: In ASTR310 box outside the tutorial room

1. A distant object is discovered to have a small moon, with their relative positions pictured below at several instants (take the orbit to be 'in the plane of the sky'). The period of the moon's elliptical orbit is found to be 620 days with an eccentricity of 0.82. The angular size of its orbital *major* axis is 1.4 arcseconds. The object and its moon are at a distance of 39 AU from Earth. What is the object's mass, in kg and in Earth masses?



2. You observe a comet in our inner Solar System on Oct 1st 2014 and determined it passed by the Sun with a perihelion of 0.812 AU and measured its orbital eccentricity to be 0.73. You want to search through historic records to determine if this comet has been observed in the past. Which calendar years should you search if you wanted to find records of its last two perihelion passages (when it would be most easily seen)?
3. The Cassini spacecraft regularly makes images of the surface of Saturn's moon Titan using 2.2 cm wavelength radar waves, and has been studying landforms in frozen ethane lakes. Suppose there are two nearby islands 1 km apart poking out of the lake. Could Cassini's radar images resolve the islands apart if it makes the image during a flyby at 1200 km above the surface of Titan, when travelling 6.1 km/second?