

The Solar System – Exercise classes

Problem Set 2

Distributed: 21 Oct 2024, results due: 28 Oct 2024.

Problem 2.1

Up to which order (n or m) would you need to write down Earth's gravitational moments to be able to see the influence of the JenTower? (1 point)

Bonus problem 2.2

A space probe approaches an asteroid at a relative velocity of 10 km/s, then passes the asteroid at a closest distance of 10^5 km. The fly-by changes the space probe's course (relative to the asteroid) by only $1''$. What is the mass of the asteroid? (2 points)

Problem 2.3

The sidereal orbital period of the Moon around the Earth is 27 days. The orbital plane is tilted by 29 degrees with respect to Earth's equatorial plane. Determine the precession period of Moon's orbit as caused by Earth's gravitational momentum $J_2 = 1.08 \times 10^{-3}$. The actual precession period of Moon's orbit is 18.6 years. What conclusions can you draw? (2 points)

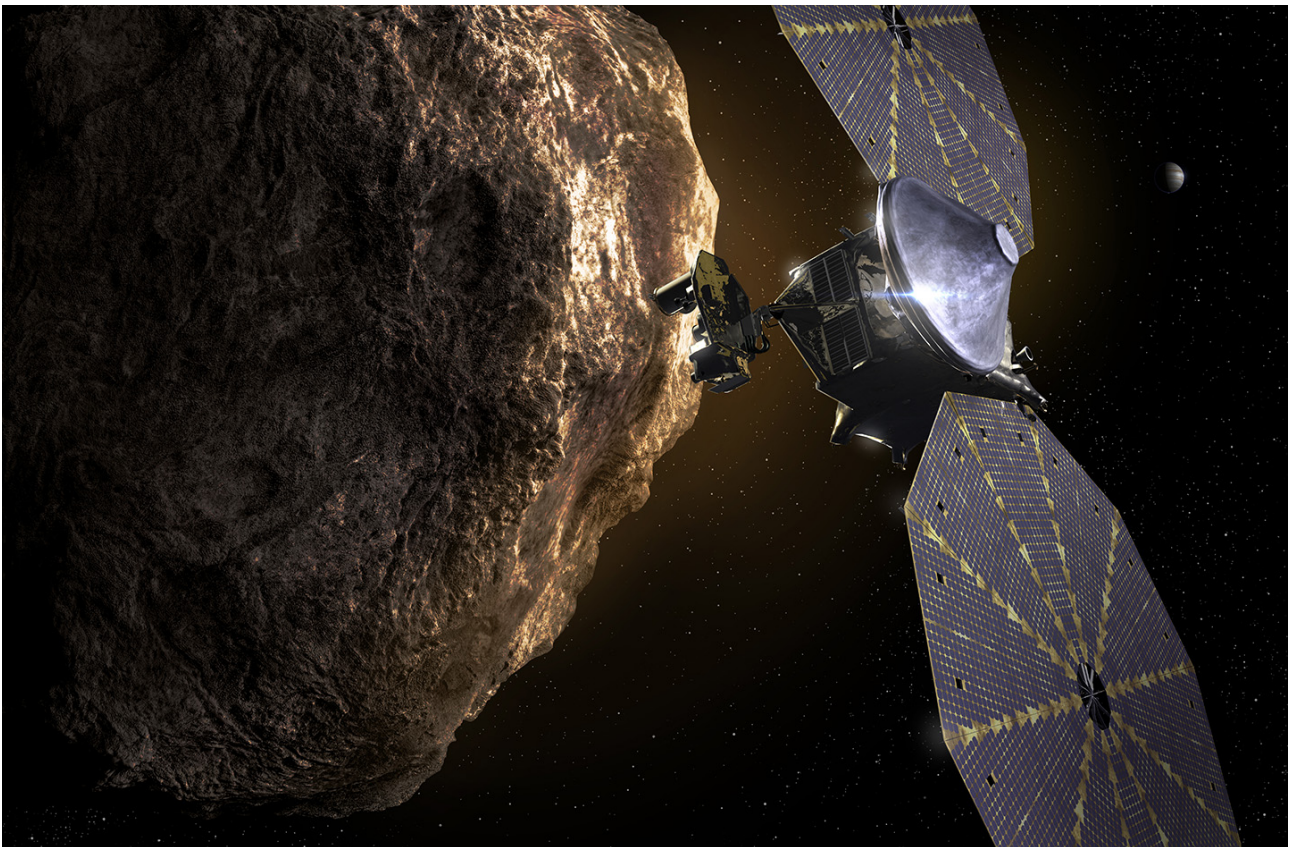


Figure 1: Artist's conception of space probe Lucy (launched 16 Oct 2021) passing by an asteroid. (Image credit: NASA/SwRI).