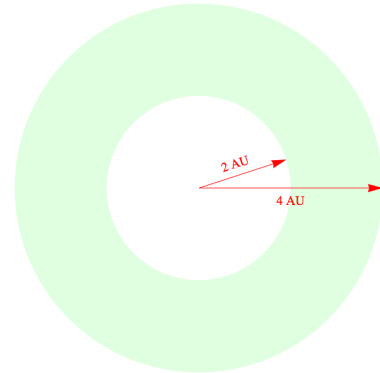**Arvind Borde**
AST 9: Homework 11b

1] The asteroid belt extends from roughly 2AU to 4AU. Assume that the belt is roughly flat. Using the formula for the area of a circle (πr^2) and the conversion that an AU is roughly 1.5×10^8 km,
a) What is the area of the belt in km^2?
b) If there are a billion asteroids, how many per square-km?
c) Does your answer suggest the asteroid belt is crowded or not?
d) In one of the Star Wars movies C-3PO says this to Han Solo: "Sir, the possibility of successfully navigating an asteroid field is approximately three thousand seven hundred and twenty to one." Could this be true of our asteroid belt?

2] We've seen before that the ratio of the length of a year on a planet to $a^{3/2}$ is constant. Why? What is a? We've seen, also, that if the planetary year is measured in earth years and a in AU, that the ratio is 1. That means that in these units a "year" is roughly equal numerically to $a^{3/2}$. Use this, and the information in question 1, to calculate the longest and shortest possible years on an asteroid.

3] Below are historical depictions of comets in art with the dates on which the comets appeared. Which of these could have been Comet Halley?


1264   1401   1456   1556

http://io9.com/the-greatest-representations-of-comets-in-the-history-o-1648504019

4] The orbit of the Rosetta spacecraft is shown on the right.
a) Why did it loop around the Earth and Mars before heading to the comet (Comet 67P, Churyumov-Gerasimenko)?
b) The picture shows large solar panels sticking out from the craft. The comet it was trying to catch was traveling at over 67,000 km/hour (between the speeds of Mars and Jupiter). On earth, vehicles that travel fast need to be streamlined and can't have large flat panels sticking out. Why is that not a factor in space missions?
c) When Rosetta arrived at the comet, they were at $2.9\,$AU from the sun. What region of the solar system is that?
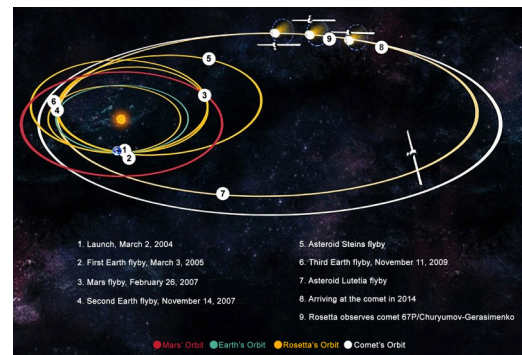
5] In movies, comets are sometimes depicted as visibly moving across the sky as people gaze at them. The high speed of the comet that Rosetta landed on, may make this seem a plausible depiction. Is it?