

## Homework 5

Please write all your work and answers on separate paper. (You can turn in this page with the questions or not, as you wish). Show all your work on calculations and explain your reasoning whenever you can.

1. **Two tails:** Explain how a comet can have two tails.
2. **Really out there:** Explain the differences between the Kuiper belt and the Oort cloud.
3. **Look, it's Halley's Comet!** Edmund Halley predicted that a comet observed in 1682 would return in 1759. He did not live to see it, but when it did return it was named after him. The same comet returned in 1835, 1910, and 1986.
  - a. What is the period of Comet Halley?
  - b. When will it appear again?
4. **Peppercorns and Comets:** In the Peppercorn Model of the Solar System\* the Sun is a ball 8 inches in diameter, Saturn is the size of an acorn, and the Earth is the size of a peppercorn. The distances from the Sun out to Pluto add up to 1019 paces, with a pace assumed to be about a yard. The distance from the Sun to the Earth is about 26 yards.
  - a. The distance of Neptune from the Sun is about 30 times the distance of Earth from the Sun (it's 30 Astronomical Units = 30 AU). In the model, how far is that in yards?
  - b. The Kuiper Belt extends just beyond the orbit of Neptune to a distance of about 50 AU. In the peppercorn model, how far is that from the Sun, measured in football fields (1 football field = 100 yards)?
  - c. The Oort Cloud may extend out as far as 50,000 AU. In the peppercorn model, how far away from the sun is that, in miles (1 mile = 5280 feet)?
5. **Is Mercury safe?** Is Mercury in any danger of breaking apart due to the gravitational pull of the sun?
  - a. Compute the Roche limit of the Sun, and express it in AU.
  - b. What percentage is this of the distance of Mercury from the Sun?
  - c. What do you conclude about Mercury's fate in terms of the Roche limit?

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\* <http://www.noao.edu/education/peppercorn/pcmain.html>