

Physics 131: Survey of the Universe
Spring 2003-2004
Prof. Michael S. Vogeley
Homework Assignment 1

Due at the beginning of class, 12:30 p.m. Thursday, April 8. Please write your work and answers on a separate sheet of paper, with your name at the top and all pages stapled together.

1. Powers of Ten

(a) Express each of the following numbers in scientific notation:

5,687

one million six hundred thousand

0.0037

one one-hundredth

(b) Answer in scientific notation: What is $(7.5 \times 10^2)/(5 \times 10^3)$?

2. Light Travel Distance and Time

(a) It takes light about 60 million years to travel from the Virgo Cluster of galaxies to Earth. What is the distance to the Virgo Cluster, in units of Megaparsecs?

(b) Suppose we discover a planet around a star that is 12 lightyears away. If your spaceship can travel at $1/4$ the speed of light, how many years would it take you to get to that planet?

3. Seasons

(a) On what day of the year in Philadelphia, and at what time, is the Sun's light likely to be the most intense?

(b) After June 21, are the days getting longer or shorter? Explain.

4. The Moon and Eclipses

(a) Why is there really no "dark side of the Moon?" Explain.

(b) What causes a solar eclipse?

5. Angular Motion on the Night Sky

(a) How many degrees does the Sun appear to move in one hour? What is that angle if expressed in arcseconds?

(b) Using what you learned in part (a), how long does it take for the Sun to move across the sky an angular distance equal to its own angular diameter?

6. Angles and Distances

Calculate the parallax (also called the parallactic angle) of a star that lies 5 lightyears away. Assume that this parallax is measured using the *radius* of the Earth's orbit around the Sun as the baseline. (Hint: What would the angular size of the Earth's orbit appear to be from a distance of 7 lightyears?) Give your answer in both degrees and arcseconds.