

Name: \_\_\_\_\_

Section: \_\_\_\_\_

**Homework 1: Scientific Notation, the Celestial Sphere, and Orbits**

**Due:** In your section the week of **Jan. 28<sup>th</sup>**. Be neat and concise, show your work and remember units. An answer without the correct units is wrong.

**Collaboration policy and general instructions for this and all future homework:** The purpose of the homework is to help you learn the material (which will help you do well on the exams.) You should first attempt all the problems on your own. Consult the textbook, your lecture notes, or other references. If you are having trouble, you may *discuss* the problem with a classmate. However, what you turn in must be entirely your own work and written in your own words—you should understand everything you write down and be able to reproduce it independently if asked. Do not blatantly copy work from others. Provide a brief citation if you use information not contained in the textbook or lecture notes.

Please complete all the problems in the space below each question. You must show all your work with proper units in order to receive full credit. Your answers should be neat, concise, and to the point. There is no need to write a book when a single sentence will suffice. However, there are times where it is appropriate to provide more than a single word answer. Use discretion. You may need to use a calculator for some problems.

The homework will often require you to look up information not contained in the problems (such as unit conversions, formulas, distances to and properties of celestial bodies, etc.) Your textbook's appendices often contain useful information.

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1. (2 points) **Scientific Notation.** Very large or very small numbers are often encountered in astronomy and physics. Scientific notation provides a convenient way to write such numbers and makes the relative sizes of numbers obvious. In this course, you'll express large and small numbers using scientific notation.

a. Express the following numbers in scientific notation:

i. 12,300,000,000

ii. 0.0000000887

b. Rewrite the following list of numbers in scientific notation:

one million, one billion, one trillion, ten trillion, one-hundred quadrillion, one millionth, one billionth, one-hundred millionth.

2. (2 points) **Simple Unit Conversions.** All physical quantities (*i.e.* speed, temperature, acceleration, etc.) must have a unit associated with them. The value of a physical quantity is meaningless without the attached unit. Always label your answers with appropriate units. **An answer without the correct units is wrong.**

a. Convert 30.3 m (meters) to km, mm, and nm (you may have to look up what this means). Express your answer in scientific notation.

b. How many days, hours, minutes and seconds are there in a year? Express your answer in scientific notation.

3. (2 points).

a. Is it possible, using any means necessary (perhaps a spaceship) to reach the celestial sphere? Explain your answer.

b. If you were to travel to Alpha Centauri, would you see a celestial sphere there? Would it be the same as the one you'd see from Earth? Explain.

4. (2 points). Briefly describe (with a picture and a few sentences) Eratosthenes' method for measuring the circumference of the Earth.

5. (2 points). Using the data from your text (appendix E. Table E.2), pick your favorite planet (or sub-planet) other than Earth and verify Kepler's Third Law. For full credit you must show your work.