Feel free to discuss these problems with classmates, but write up your work independently. Put your name and discussion section on this and any additional sheets of paper and staple them together. Show your work for partial credit if you make an arithmetic error. Use scientific notation when appropriate.

1. **(4 pts) A Bit of Practice at Scientific Math**

   We will be using scientific notation throughout the course, so a bit of practice may be in order. Don’t use a calculator to do these problems or you will gain no benefit from the exercise, but feel free to check your answers with a calculator.

   a) Write the following numbers in scientific notation (e.g., \( 370 = 3.7 \times 10^2 \)).

      i) 0.000 005 650      ii) 93,000,000
      iii) 47.3         iv) 1/20

   b) Do the following computations.

      i) \((3 \times 10^3) \times (2 \times 10^1)\)  ii) \((3.8) \times (2 \times 10^8)\)
      iii) \((4 \times 10^{-3})(4 \times 10^{-1})\)  iv) \((4 \times 10^{12}) \times (2.5 \times 10^{-11})\)

2. **(3 pts) Working with Angles**

   The moon on average has an angular diameter of 30’ (that is, 30 arcminutes). What is the angular size of the moon in degrees? In arcseconds? Show the units of measurement for each answer.

   Note: Giving only a number, say 33.2, is literally a meaningless answer since the units are specified. For example, is the answer 33.2 cm or 33.2 km or 33.2 furlongs? Units are fundamental to communication in science and we will stress using them throughout the semester.

3. **(8 pts) Does It Make Sense?**

   Briefly discuss statements 4, 5, 7, and 8 in the “Does It Make Sense” section at the end of Chapter 2 in your textbook (BDSV).

4. **(10 pts) Solar Motion in the Sky**

   It is December 21 at 6:00 pm. The Sun is setting on the horizon and the constellation of Pisces is high in your southern sky. Suppose that you go out every night at 6:00 pm until March 21. Describe what changes you will see in the sky over this time, considering only Pisces and the Sun.

5. **(10 pts) Planets in the Sky**
Consider Figure 2.29 in your textbook. In April 2002 very shortly after sunset all of the 5 planets visible to the naked eye were near each other in the sky. But where were they in the Solar System? On the back page is a figure of the Solar System as seen from above, with the orbits of the 5 planets shown. The positions of the Earth and Jupiter on April 23, 2002 are shown.

a) Based on Figure 2.29, show where Mercury, Venus, Mars and Saturn were in their orbits on April 23, 2002.

b) In the sky, Saturn was closer to the Sun than Jupiter. Was Saturn closer to the Sun than Jupiter in space (e.g., as measured in kilometers)? Briefly explain your answer.

6. (5 pts) Sample Exam Question: Circle the correct choice.

As the Sun sets in the west, you might see

a) The new moon rising in the east.
b) The full moon high in the south.
c) The quarter moon rising in the east.
d) The quarter moon high in the south.
e) None of the above.

Figure for Problem 5: