Please read and follow all instructions carefully. Feel free to use your book, notes, and a calculator to complete the assignment. I encourage you to discuss the problems with your classmates to enhance learning, but do NOT copy someone else's work. You are ultimately responsible for your work. Please turn in your work on or before the due date.

PART ONE: Problem Solving

Please solve these problems in the space provided. SHOW YOUR WORK!

1. **Ellipses and Kepler's First Law**

   a) Pluto's orbit around the Sun has a semimajor axis (a) of 40 AU and an eccentricity (e) of 0.25. When Pluto is closest to the Sun (at perihelion), what is its distance from the Sun in AU? When Pluto is farthest from the Sun (at aphelion), what is its distance from the Sun in AU?

   Pluto's perihelion distance in AU = _____ AU

   Pluto's aphelion distance in AU = _____ AU

   b) Neptune's orbit has a = 30 AU and e = 0.01. Repeat the above calculation to compute Neptune's distance from the Sun at perihelion and aphelion.

   Neptune's perihelion distance in AU = _____ AU

   Neptune's aphelion distance in AU = _____ AU

   c) Is Pluto always the farthest of the original nine planets from the Sun?

2. **Kepler's third law.** Saturn's orbit has a semimajor axis (a) of 9.5 AU. Compute its orbital period in years using Kepler's third law. (You can check your answer with the value listed in Appendix E, but show your work for full credit)

3. **Tides.** Explain the difference between spring and neap tides with the help of a diagram and a few words.

4. **Motion & Acceleration.** An object starts moving from rest with a uniform acceleration of 10 m/s^2. At what speed will it be traveling after 4 seconds?

PART TWO: Multiple Choice

Circle the right answer:

5. Which one of the following is NOT an attribute of the scientific method?

   a) Raises questions based on observations or experiences
   b) Seeks to explain observations based solely on natural phenomena
   c) Rejects answers that are not consistent with established theories
   d) Favors the simplest explanation for a given question
   e) Makes predictions that can be verified by further experiments or observations

6. Jupiter is 5 times farther from the Sun than the Earth is from the Sun. Using Newton's gravitational law (inverse square law), what can you say about the Sun's gravitational force at Jupiter's location compared to the force at Earth's location?

   a) The gravitational force at both locations will be the same
   b) Jupiter will experience 1/25 of the gravitational force that Earth experiences
   c) Jupiter will experience 25 times the gravitational force that Earth experiences
   d) Jupiter will experience 1/5 of the gravitational force that Earth experiences
   e) Jupiter will experience 5 times the gravitational force that Earth experiences

7. The following questions on page 86 of the text (end of chapter 3). Circle the right answer:

29.	(a)	(b)	(c)
30.	(a)	(b)	(c)
31.	(a)	(b)	(c)
32.	(a)	(b)	(c)
33.	(a)	(b)	(c)

8. The following questions on page 141 of the text (end of chapter 4). Circle the right answer:

29.	(a)	(b)	(c)
30.	(a)	(b)	(c)
31.	(a)	(b)	(c)
33.	(a)	(b)	(c)
34.	(a)	(b)	(c)

Name: _____

BONUS QUESTIONS: For full credit, SHOW YOUR WORK!

1. Mars' orbit has a semimajor axis of 1.5 AU. Assuming its orbit to be circular, at what speed does Mars travel around the Sun (in km/s). You need to compute the answer based solely on the facts given in this question, basic geometrical facts such as the equation for the circumference of a circle, and Kepler's third law.

2. Among all the astronomers you have heard of in this class until now, who do you think has made the greatest contribution to astronomy? Give at least three short reasons in support of your answer.