**Name:\_\_\_David Erickson\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PHYS 110 Assignment 2 Due: Friday September 21, 2018 at 1:00 PM**

*Instructions: The assignment is to be handed in at the beginning of class on the date that it is due. Please submit your answers in typed format (if possible). Please use this question sheet as a cover page so that others cannot easily see your grade when receiving it back.*

1. Question # 3 from **Chapter 3** of the course textbook. **[4 points]**
   1. What would happen to the Earth’s motion if the Sun were suddenly replaced by a black hole with exactly the same mass as the sun?
      1. It would still orbit in the same way. The gravitational pull is determined from the masses of 2 objects and the distance between them. It would continue on as if nothing happened.
2. Question # 5 from **Chapter 3** of the course textbook. **[4 points]**
   1. An object moves in a circular orbit at a constant speed. Are there any forces on the object? Explain.
      1. Yes, the force of gravity of the object it is circling that keeps the object in the orbit. It is based on the universal law of gravity that states that every object with a mass is attracted to every other object by the force of gravity.
3. Question # 7 from **Chapter 3** of the course textbook. **[4 points]** 
   1. Briefly describe the contributions of each to the advancement of astronomy:
      1. Aristarchus – He was an early proponent of the Sun-centered universe. Maintained that the earth rotates on its axis. Also made observations about the sizes and distances of the sun and moon which still survive today.
      2. Copernicus – reintroduced the idea of a sun-centered universe, with the Earth and planets orbiting the Sun in perfect circles. The Copernican revolution eventually brought the downfall of the geocentric model.
      3. Tycho Brahe – Discovered that the best astronomical tables contained many errors in the position of stars and planets. He spent his time and resources to catalog as precisely and accurately as possible the position of objects in the sky.
      4. Kepler – created a second law that states that as a planet orbits the Sun, it sweeps out equal area in a n equal time interval. As a planets travels along its orbit form position A to B, it sweeps out an area swept out when going form position C to position D for an equivalent time period.
      5. Galileo – Was the first person to use a telescope to view the heavens and publish his observations. As a result, the heliocentric model, eventually replaced the geocentric model as the correct description of the solar system. He observed that the Moon was covered in mountains, valleys, and craters, indicating that its surface is not smooth and “perfect” as proclaimed by the geocentric supporters.
      6. Newton – revolutionized physics with his laws of motion and universal law of gravity. He also did important work on light and optics, including the design and fabrication of the first reflecting telescope.
4. Question # 17 from **Chapter 3** of the course textbook. **[4 points]** 
   1. The New Horizons spacecraft passes Pluto in July 2015. At the time of closest approach on July 14, 2015, Pluto was 34 AU from the Earth. How long did it take for a radio signal (traveling at the speed of light) from New Horizons to travel from Pluto to the Earth at the time of closest approach?
      1. It took about 4.5 hours
5. Question # 18 from **Chapter 3** of the course textbook. **[4 points]** 
   1. Explain how a rocket can operate in the vacuum of space.
      1. As hot gas is expelled from the end of a rocket engine, there is a reaction force in the opposite direction on the inside surface of the rocket engine nozzle. Newton’s third law of motion thus explains how a rocket is able to propel itself forward, even in the vacuum of space.