Physics Problem Set #5

Show your work if you want partial credit.
Due Tuesday, Dec. 8

1. Suppose that two objects attract each other with a gravitational force of 16 units. If the distance between the two objects is quadrupled, then what is the new force of attraction between the two objects?.

2. What is the force of gravity (in Newtons) that exists between a student of mass 65 kg and a textbook of mass 1.5 kg if they are 0.5 meters apart?

3. The mass of Jupiter is 1.9×10^{27} kg, and its radius is 6.98×10^{7} m. What is the force of gravity of a 76 kg. person on the surface of Jupiter?

4. The radius of earth is 6.37×10^{6} m. What is the value of g (in m/s/s) when considering a 120 kg object on the surface of the earth?

5. What is the value of g (in m/s/s) when considering a 120 kg object that is 2500 km above the surface of the earth?

6. Neptune's mass is 1.03×10^{26} and its radius is 2.27×10^{7}. What is the value of g (in m/s/s) on the surface of Neptune? What is the force of gravity (in Newtons) of a 5 kg object on the surface of Neptune?

7. Given that Earth's period is 1 earth-year, and its distance from the sun is 1 astronomical unit (au), what is the period of Saturn (in earth-years) if its distance from the sun is 19.8 au?

8. Suppose a small planet is discovered which is 16 times as far from the sun as the Earth's distance is from the sun (1.5×10^{11} m). Use Kepler's law of harmonies to predict the orbital period of such a planet.

9. Consider a satellite which is in a low orbit about the Earth at an altitude of 240 km above Earth's surface. Determine the orbital speed of this satellite. Use the information given below.

$G = 6.673 \times 10^{-11}\ Nm^2/kg^2$

$M(earth) = 5.98 \times 10^{24}$ kg

$R(earth) = 6.37 \times 10^{6}$ m