Name: 12/07/11

Assignment #15: Universal Gravitation

Object	Mass (kg)	Orbital Radius (m)
Mercury	3.30200×10^{23}	5.79×10^{10}
Venus	4.86900×10^{24}	1.08×10^{11}
Earth	5.9742×10^{24}	1.496×10^{11}
Mars	6.4191×10^{23}	2.279×10^{11}
Jupiter	1.8987×10^{27}	7.78×10^{11}
Saturn	5.6851×10^{26}	1.433×10^{12}
Uranus	8.6849×10^{25}	2.87×10^{12}
Neptune	1.0244×10^{26}	4.503×10^{12}
Luna (Moon)	7.36×10^{22}	3.84×10^{8} (Around Earth)
Sol (Sun)	1.98892×10^{30}	2.5×10^{20} (around Galactic Center)

1. What is the force that the earth exerts on the moon?

2. The planets Jupiter and Saturn are at the closest approach in their orbits.
   a) What is the force of Saturn's gravity on Jupiter?

   b) What is the acceleration of Jupiter?

3. You in a spaceship hovering (not orbiting) above the planet Neptune, at an altitude of 125,000,000 m. If you spaceship weighs 2 million kilograms, what is the force Neptune's gravity on you?

Name: 12/07/11

4. Beauford, who has a mass of 125 kg, is sitting 1 meter away from his true love, Beaulah, who has a mass of 130 kg, on flat, frictionless surface.
    a) What is the force of gravity between Beauford and Beaulah?

    b) What is Beaford's acceleration toward Beaulah?

5. The force of the gravity of the earth causes Billy-Bob to fall off a barn and accelerate toward the earth at a rate of 9.8 m/s^2. What is the distance that Billy-Bob is from the center of mass of the earth?

6. As the planets orbit the sun, they cause the sun to wobble very slightly. During a planetary alignment, the effect of the planets on the sun is additive.
    a) Calculate the maximum possible acceleration that the planets could cause the sun to have.

    b) At this rate, how long would it take the sun to travel the distance of the earth's orbit?