MP - MR. NICASTRO 2nd QUARTER WORKSHEET
UNIVERSAL GRAVITATION

1. The gravitational force of attraction between the earth and sun is 1.6×10^{23} N. What would this force have been if the earth had been twice as massive?

2. The gravitational force of attraction between the earth and sun is 1.6×10^{23} N. What would this force have been if the earth had formed twice as far away from the sun?

3. Tim, whose mass is 60.0 kg, is doing his physics homework, while sitting at his table in room D205.
a) How much gravitational force does he exert on 55.0-kg Loren, sitting 1.50 m away?
b) How does this compare to what he exerts on 65.0-kg Jon, 4.00 m away in the back row?

4. When Joe was 10 years old, he had a mass of 30 kg. By the time he was 16 years old, his mass increased to 60 kg. How much larger is the gravitational force between Joe and the earth at age 16 compared to age 10?

5. Astrologers claim that your personality traits are determined by the positions of the planets in relation to you at birth. Scientists argue that these gravitational effects are so small that they are totally insignificant. Compare the gravitational attraction between you and Mars to the gravitational attraction between you and the 70.0-kg doctor who delivered you at the moment of your birth, if the doctor stands 0.500 m away. (The mass of Mars is 6.42×10^{23} kg, and the approximate distance between the earth and Mars when you were born is 7.83×10^{10} m.)

6. Our galaxy, the Milky Way, contains approximately 4.0×10^{11} stars with an average mass of 2.0×10^{30} kg each. How far away is the Milky Way from our neighboring Andromeda Galaxy, if Andromeda contains roughly the same number of stars and attracts the Milky Way with a gravitational force of 2.4×10^{30} N?

7. Tides are created by the gravitational attraction of the sun and moon on the earth. Calculate the net force pulling on the earth during: a) a new moon; b) a full moon; c) a first quarter moon. The diagram below is intended to help your understanding of the situation, but is not drawn to scale.

mass of moon: 7.35×10^{22} kg

mass of earth: 5.98×10^{24} kg

mass of sun: 1.99×10^{30} kg

distance from earth to moon: 3.84×10^{8} m

distance from earth to sun: 1.50×10^{11} m