W5.06

Circular Motion Review

1. The average orbital radius of Jupiter around the Sun is 7.78×10^{11} m. Given that the mass of the Sun is 2×10^{30} kg, determine the orbital period of Jupiter (in years).

2. Determine the acceleration of gravity on Venus given that the radius of Venus is 95% that of Earth and that the mass of Venus is 81% that of Earth. (Don't use your planetary data table! Use $g_E = 10 m/s^2$.)

3. A highway turn has a radius of 50 m. The turn is not banked and is designed so that the maximum speed for a car should be approximately 20 m/s. What is the minimum coefficient of friction that is necessary for the car to negotiate this turn?

4. A highway turn of radius 750 m is designed for a speed of 65 mph (29 m/s). What is the angle of the bank? (Hint: designed for means that no friction would be needed at the design speed. You will need a little trigonometry.)

5. A 0.2 kg yo-yo is spun in a <u>vertical</u> circle at the end of a 2 m string.

    a. What is the speed of the yo-yo if the tension in the string at the top of the circle is 8 N?
    b. If the speed of the yo-yo at the bottom of the circle is 13.4 m/s, determine the tension in the string at the bottom of the circle.
    c. The same yo-yo is used as a conical pendulum. The string is found to make a 60° angle with the vertical. Find the speed of the yo-yo, and the tension in the string.

Answers:
1. 11.8 yr
2. 9.0 m/s^2
3. 0.8
4. 6.4°
5. a. 10 m/s
    b. 20 N
    c. 5.48 m/s; 4 N