PHYSICS 2414 - Fall 1999
Unit 4 - Circular Motion and Gravity

Reading: Sections 5.0 - 5.4, 5.5 - 5.10
Homework: Chapter 5 - Questions 14
Problems 3,7,13,20,23,30,33,43,53,63,69,70,76
Problems (on this Assignment Sheet): A,B

Dates:

- Reading Questions (Chapter 5).....Friday, October 1, 8:00 a.m.
- Homework Due .....Tuesday, October 12, 5:00 p.m.
- Midterm on Units 1 - 4.....Wednesday, October 13

Homework may be turned in during discussion class on Tuesday, or placed in the box outside of my office before 5:00 p.m. Solutions to the homework will be in Bizzell library, the Physics library, and on the web page by 5:00 p.m. on Tuesday. If you want to use your homework to help you study for the midterm, I suggest you photocopy your homework before turning it in, then compare your photocopied homework with the solutions.

Reading questions are to be submitted directly from the World Wide Web using the form available at http://www.nhn.ou.edu/~strauss/phys2414. If you try to submit answers to the reading questions on the web, but the answers are rejected, please e-mail me at *mgstrauss@ou.edu* and describe the problem in detail.

READING QUESTIONS FROM CHAPTER 5:

1. If an object is undergoing uniform circular motion, what direction is the net force acting on the object? 2. If an object is going around in a circle, is it accelerating? 3. If so, what direction is the acceleration and what is the acceleration called? 4. Is there such thing as centrifugal force? Why or why not? 5. What does "centripetal force refer to? 6. Is centripetal force a new kind of force? Why or why not? 7. If an object going around in a circle is released, what direction will it go? 8. If an object is turning and speeding up which direction is the acceleration? 9. How far away from each other do two objects still feel some gravitational attraction (force)? 10. How does the acceleration of gravity g relate to Newton's universal gravitational constant G? 11. How does the force of the earth on an object, like a person, relate to the force of the object on the earth? 12. How is the orbit of the moon like an apple falling from a tree? 13. What does it mean to be "weightless"? 14. In order to apply Kepler's laws to the orbit of two different objects, what must be the same? Final Question (must be answered to receive any credit on the reading assignment): What is one thing from the reading that you didn't understand or need clarified?

ADDITIONAL HOMEWORK PROBLEMS (not Reading Questions)

(These problems must be solved using the form and all the steps in *The Competent Problem Solver*)

A) You have been asked to be a consultant for a new science fiction show. In this show, a large space station is being built. The space station is a large tube, shaped like a doughnut with people living and working inside the tube. In order to create artificial gravity, the space station rotates on its axis. The special effects department wants to know at what rate the space station, with a diameter of 400 meters, must rotate to create artificial gravity equal to that on earth. Also, on which wall of the tube will the people walk.

B) A neighbor's child wants to go to a neighborhood carnival. The neighbor is worried about the safety because one of the rides looks dangerous. She knows that you are taking physics so she asks for your advice. The ride in question has a 10-lb (45 N) chair which hangs freely from a 10 meter long chain attached to a pivot on the top of a tall tower. When a child enters the ride, the chain is hanging straight down. When the ride starts up the chain rotates around the tower. At its maximum speed, the chain rotates around the tower once every 3.0 seconds. When you ask the operator, he says the ride is perfectly safe. He demonstrates this by sitting in the stationary chair. The chain creaks, but holds. He weighs 200-lbs (890 N). Has the operator shown that this ride is safe for a 50-lb (220 N) child?

Answers to even numbered problems: 5-20) 0.23; 5-30) $g_h = 0.91 g_{surface}$; 5-70) a)3 .0 km, b) 5.5×10^3 N, c) 3.9×10^3 N; 5-76) 29.2 m/s; A) One revolution every 28 seconds.; B) No, only if he weighed 11,600 N.