Homework Set 14B

PH 113 – 10

Q1. You are holding an elliptical serving platter. How would you need to travel for the serving platter to appear round to another observer? Explain your answer.

P1. A spacecraft of the Trade Federation flies past the planet Coruscant at a speed of 0.600 *c*. A scientist on Coruscant measures the length of the moving spacecraft to be 74.0 m. The spacecraft later lands on Coruscant, and the same scientist measures the length of the now stationary spacecraft. What value does she get?

P2. A meter stick moves past you at great speed. Its motion relative to you is parallel to its long axis. If you measure the length of the moving meter stick to be 1.00 ft (1 ft = 0.3048 m) — for example by comparing it to a 1-foot ruler that is at rest relative to you — at what speed is the meter stick moving relative to you?

P3. As measured by an observer on the earth, a spacecraft runway on earth has a length of 3600 m. (A) What is the length of the runway as measured by a pilot of a spacecraft flying past at a speed of 4.00×107 m/s relative to the earth? (B) An observer on earth measures the time interval from when the spacecraft is directly over one end of the runway until it is directly over the other end. What result does she get? (C) The pilot of the spacecraft measures the time it takes him to travel from one end of the runway to the other end. What value does he get?

P4. A rocket ship flies past the earth at 85.0 % of the speed of light. Inside, an astronaut who is undergoing a physical examination is having his height measured while he is lying down parallel to the direction the rocket ship is moving. (A) If his height is measured to be 2.00 m by his doctor inside the ship, what height would a person watching this from earth measure for his height?. (B) If the earth-based person had measured 2.00 m, what would the doctor in the spaceship have measured for the astronaut's height? (C) Suppose the astronaut in part (A) gets up after the examination and stands with his body perpendicular to the direction of motion. What would the doctor in the rocket measure for his height now?