Homework #1

1. A famous traveler took 80 days to go around the world. At the same average speed, how long would it take him to go to (a) the moon, (b) the sun, (c) Pluto (6 x 10^{14} cm away), (d) the nearest star, Alpha Centauri (4 x 10^{12} cm away)?

2. What is the speed of light in feet per nanosecond?

3. The Empire State building is 102 stories high. About how high is it in centimeters.

4. What is the angular velocity in radians per sec corresponding to 100 rpm?

5. The second hand of a wrist watch is 1.2 cm long from the center of the dial to the tip of the hand. Calculate the velocity and acceleration of the tip.

6. Calculate the velocity, angular velocity and acceleration of the earth in its approximately circular orbit around the sun.

7. A space station has the shape of a doughnut. The distance from the center of the hole to the center of the "dough" is 100 m. With what angular velocity must it be made to rotate so that a spaceman living in the "dough" experiences the same acceleration as on the surface of the earth?

8. A plate is knocked off a table with a horizontal velocity of 42 cm sec^{-1}. If the table is 76 cm high, what is the angle between the velocity of the plate and the horizontal at the instant just before it hits the floor?

9. A tire has a diameter of 50 cm. What is the acceleration of the highest point on it, when the car has a steady speed of 60 mph? [The point on the tire touching the road is known to be instantaneously at rest.]

10. If a rocket is fired at 60° to the horizontal with an initial speed of 500 mph, calculate its time of flight and range (in miles) on a horizontal plane.