

Supplemental Homework Problems – Rectilinear Motion

Try the problems below. If you have questions, talk with each other or with your instructors. We will talk about these and other problems during our problem solving session as marked on your course schedule. Please work other problems from the book or elsewhere as well as those below if you wish; that is, don't feel that these problems alone are sufficient.

1. Chapter 4, Problem 7 in the Reist book.
2. Chapter 4, Problem 9 in the Reist book.
3. Consider the drag force that acts on your 1987 Porsche 928. The drag coefficient for this car is 0.32. You estimate that the projected area for the car is about 18 square feet, because it is about five feet wide and four feet wide, but has some curves.
 - a. Recall that power = force x velocity. Show that horsepower required to overcome air drag increases with the cube of the speed at which you are driving.
 - b. Calculate the horsepower required to overcome the air drag that acts on this car as you drive it at 165 miles per hour. Hint: You can find useful conversion factors for units in the CRC handbook.
 - c. The top speed for this car is about 170 miles per hour in stock form; the engine develops 320 horsepower under these conditions. You decide to spend \$1000 and buy a computer chip upgrade and a rear muffler bypass, which together will add about 20 horsepower to engine output. How much faster will you be able to go now? Was this investment worth it?
4. You are riding your bicycle home, coasting down the hill on Airport Road at 28 miles per hour according to your speedometer. As you coast down the hill, a fellow your size but who probably outweighs you by 50 pounds coasts past you, and calls back over his shoulder "Hey, you must have a problem with your wheel bearings if you're coasting that slowly!" What reason other than bad bearings could explain the difference in coasting speed? Explain your reasoning.