Appropriate any time after Chapter 4:

Heavy Traffic

Bad things can happen when you tailgate, that is, when you follow another car too closely. If the car ahead brakes suddenly, you may crash into it. Beginning drivers are often told to keep at least one car length behind for every 10 miles per hour of their speed. For example, a car travelling at 60 miles per hour should stay at least 6 car lengths away from the car in front.

Does this make sense? That would mean that cars travelling twice as fast need only keep twice as far away. Does that seem too simple? Perhaps you don't have to be twice as far away. But maybe you really need to be *more* than twice as far away!

Laboratory: **Tailgating**

Your task is to investigate tailgating. In particular, we want you to decide if a car travelling twice as fast need only keep twice as far back.

For your model, assume that car brakes work by friction. If you've read section 4.16, Falling Rain, you know this means that the velocity of a car, v, obeys the differential equation:

$$v' = -kv,$$

where k is a positive constant, called the **coefficient of friction**. Assume that your car and the car you are following have the same coefficient of friction. Assume that the time it takes for you to notice that the car in front is braking and to apply your own brakes, b, is constant and doesn't depend

on your speed. Assume that both cars are initially travelling at speed s. How much distance should you leave between you and the car in front to be sure you can stop without hitting it? Your answer will be a function d of k, s, and b. Does d(k, 2s, b) = 2d(k, s, b)?

Good luck! And drive carefully!