1. A car is traveling at 45 m/s (~97 mi/hr) passes a stopped cop. One second after the speeding car passes the cop, the cop starts out, accelerating at a constant rate to catch the car. The cop's acceleration is 3 m/s^2. How long does it take the cop to overtake the car?

2. How long does it take a car to cross a 30 m wide intersection if the car is traveling at a speed of 21 m/s (when the car reaches the red light)? Assume that the car accelerates at a constant rate of 2.00 m/s^2.

3. A person throws a ball of mass m upwards into the air with an initial velocity of 15 m/s. How high does the ball go, and what is the time of flight of the ball from the time of release until the ball comes back to the person?

4. You are driving at 30 m/s when you enter a one-lane tunnel. As soon as you enter you notice a slow moving van 155m ahead traveling at 5 m/s. If you apply the brakes, but can only decelerate at a 2 m/s^2 because the road is wet, will you collide with the van? If so, how far from the tunnels entrance will the collision occur? If there will be no collision, what is the closest distance you come to the van?

5. A commuter train travels between two downtown stations. Since the stations are only 1 km apart the train never reaches the maximum possible cruising speed. The engineer minimizes the time t between the two stations by accelerating at a rate of 0.1 m/s^2 for a time t_1 and then by braking with an acceleration of -0.5 m/s^2 for a time t_2. What is the minimum time of travel t and the time t_1?