Worksheet 4 - Physics of Tailgating

1. (a) A car travelling at 24 m/s can slow down at a rate of 8.0 m/s^2. If while driving this car you notice a child in the street 41 m in front of the car, can the car stop without hitting the child. Give mathematical evidence.
   (b) Assuming your reaction time is 0.25 seconds, can the car still stop without hitting the child? Give mathematical evidence.

2. You are driving at a constant speed of 22 m/s, when a child suddenly steps into the path of your vehicle 52 m away. When you fully apply the brakes, your car slows down at a rate constant rate of 5.0 m/s^2. What is the **minimum reaction time (ie. how long does he have to apply the brakes)** that is required so that the child will not be hit?

3. A motorist is driving along a city street with a velocity of 50.0 km/h [W]. The motorist sees a soccer ball roll onto the street.
   (a) Determine the velocity of the motorist (in m/s).
   (b) The motorist takes 0.460 s to react and then start to brake. What is the displacement of the vehicle before the motorist starts to brake?
   (c) The acceleration of the car is 6.10 m/s2 [E]. How long does the car take to come to a complete stop?
   (d) What is the total displacement of the car before it comes to a stop?

4. A car is travelling along the highway at 95 km/h when the driver sees a moose crossing the road. About 0.50 s after he sees the moose he applies the brakes and stops the car. The braking acceleration of the car is -6.5 m/s^2. Calculate:
   (a) the distance travelled by the car during the time period from the first sighting of the moose to the time the brakes are applied
   (b) distance travelled after the brakes are applied
   (c) total stopping distance.

5. The stopping time for a vehicle is the sum of the driver's reaction time and the braking time. The average reaction of an undistracted driver is about 0.70 s. A car is travelling at 28 m/s [W] when the driver spots a moose on the road ahead and applies the brakes causing an acceleration of 6.2 m/s^2 [E].
   (a) Calculate the stopping time of the car from the time the driver first spots the moose.
   (b) If the moose is only 85 m from the car when it's spotted, will the car be able to stop in time? Justify your answer with calculations.