PHY151 Practical Questions for Sept 19 to 23

1. A car makes a round trip of 37 km travelling at a constant speed of 45 km/hr. A heavy truck makes the same trip travelling at 30 km/hr on the way there but much faster on the way back due to having offloaded the cargo (in basically zero time). What minimum return speed does the truck need to travel at in order to beat the car back to the starting point?

2. Water is dripping from the roof of a building. You see the drips fall passed your window. Your window is 1.5 m tall and you measure that each drop of water takes, on average, 0.13 seconds to fall passed your window (from top to bottom of your window). How high above the bottom of your window is the roof?

3. A person runs 100.0 meters in 10.0 seconds. During the first 4.00 seconds their acceleration is
$$a(t) = a_0 \left(1 - \frac{t}{4\,\mathrm{s}}\right)$$
where a_0 is an unknown constant. After 4.00 seconds the acceleration is zero. Find the top speed of the runner.

4. Modelling question: A cheetah has a top speed of 28 m/s. It is hunting a gazelle, which has a top speed of 25 m/s. However, the cheetah can only maintain top speed for about 15 seconds, whereas the gazelle can run for much longer. How close must the cheetah get to the gazelle while hiding in order to catch the gazelle?