Name:	Signature:
Department:	Number:

Q1. (25 points)

A police car is traveling in a straight line with constant speed v_p . A truck traveling in the same direction with the speed $3v_p/2$ passes the poice car. The truck driver realizes that he is speeding, and immediately begins to slow down at a constant acceleration of $-a_x$ until he comes to a stop. This is his lucky day, however, and the police car (still moving with the same constant speed) passes the truck driver without giving him a ticket.

(a) Express the two cars' second meeting time in terms of the given variables.

(b) Find the velocity at the instant they meet again and show that it does not depend on the acceleration of the truck.

(c)Sketch the x-t graph for the two vehicles.

(d) Find the maximum velocity the truck can have, so that the police car will reach him before it stops.

Q4. (25 points)

Hercules is trying to raise a chain consisting of three identical links. Each link has a mass of 500 kg. The three-piece chain is connected to a rope and then suspended vertically, with Hercules holding the upper end of the rope and pulling upward by a force of 15000 N.

- i. Draw the free body diagram for the entire chain considered as a single body.
- ii. Draw the free body diagram for *each* of the links in the chain.

iii. Find the acceleration of the chain.

iv. Find the force exerted by the top link on the middle link.