Wherever applicable, please answer problems using exact values (i.e. fractions instead of decimals).

(1) (a) A pharmacist is to prepare 25 milliliters of special eye drops for a glaucoma patient. The eye-drop solution must contain a concentration of 3% active ingredient, but the pharmacist only has a solution with a concentration of 10% active ingredient and a solution with a concentration of 1% active ingredient in stock (unlimited quantities of each). Can the pharmacist use the solutions she has in stock to fill the prescription? If so, how? If not, why not?

(b) The same pharmacist receives a large number of orders for special eye drops for glaucoma patients. The prescriptions vary in volume but each requires a concentration of 3% active ingredient. Help the pharmacist find a convenient way to determine the exact amounts of the 10% solution and the 1% solution needed for a given volume of eye drops.

(2) Claudia and Marco own a restaurant. Each morning, Claudia walks from their house to the restaurant along a straight path. The distance from their house to the restaurant is 2 miles. One day, Claudia leaves home at 7 am. She walks at a constant pace of 4 miles per hour until 7:20 am, and then she sits down on a park bench for eight minutes. When she starts walking again, she walks at a constant pace of 5 miles per hour until she arrives at the restaurant.

(a) What is Claudia’s distance from her home at any given moment during her walk to the restaurant?

(b) If Marco leaves their house at 7:20 am and speed walks to the restaurant along the same path as Claudia at a constant rate of 8 miles per hour, will he catch up with her before she arrives at the restaurant? If so, at what time?