PHYS 161	**QUIZ 1**
February 11, 2009	**10 POINTS**

A person takes a trip driving with a constant speed of 89.5 km/hour, in the positive x-direction except for a 22.0 min. rest stop. The person's average speed is 77.8 km/hour.

(i) How much time is spent in the trip?

We have two pieces of information. First, the average speed is 77.8 km/hour. That means that if the whole trip lasts $(t+22min)$ the total distance travelled is $v_{avg} \cdot \Delta t = 77.8km/hour \cdot (t+22min)$.

The other piece of information is that the instantaneous velocity is 89.5 km/hour and the driver is actually on the road (not on the rest stop) for a time t. Thus, the total distance travelled can also be expressed as $v \cdot t = 89.5km/hour \cdot t$

Setting the two expressions for the distance travelled equal to one another, we can solve for t. We find that

$$77.8\frac{km}{hr}(t+22min) = 89.5\frac{km}{hr}t \rightarrow \ t = 146.3min \approx 146min \text{ or 2 hours and 26 minutes.} \quad (1.1)$$

The trip lasts $t + 22min$, which gives 168 minutes or 2 hours and 48 minutes (or 2.8 hours).

(ii) How far does the person travel?

The whole trip lasts 168 minutes, and the average velocity is 77.8 km/hour. Since the distance travelled is equal to the average velocity times the total time, we find

$$x = v_{avg}\Delta t = \left(77.8\frac{km}{hr}\right)(168\ min) = \left(77.8\frac{km}{hr}\right)\left(\frac{168}{60}hr\right) = 217km \quad (1.2)$$

(iii) Draw the position/time graph of the person. Assume the rest stop to be anywhere during the trip.

Since we can put the rest stop anywhere during the trip, it is probably easiest to put it at the beginning (or at the end). See Figure 1 for acceptable graphs.

□

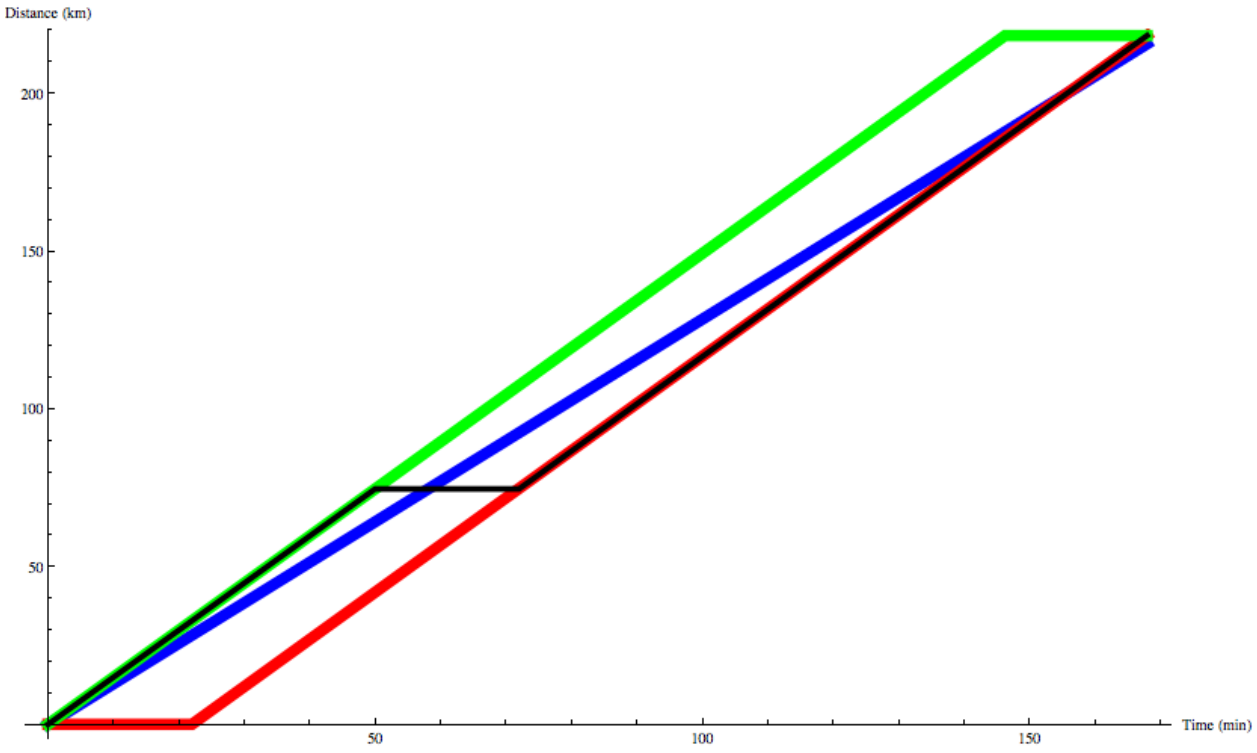

Figure 1: Graphs that look like the red line (rest stop at the beginning), black line (rest stop in the middle), and green line (rest stop at the end) receive full credit. The blue line represents the trip that someone who was travelling at the average velocity (77.8 km/hour) for the full 168 minutes would take (with no rest stop). We can see that all the lines meet at 217 km after 168 minutes.