Equation of Uniform Motion

- Motion with constant velocity is called ***Uniform:***

$$\vec{v} = const$$

- ***Equation of Motion*** gives position of a particle as a function of time.

- ***Equation of Uniform Motion in 1D***:

$$x(t) = x_0 + vt$$

Here $x_0 = x(0)$ is coordinate x at time $t = 0$,

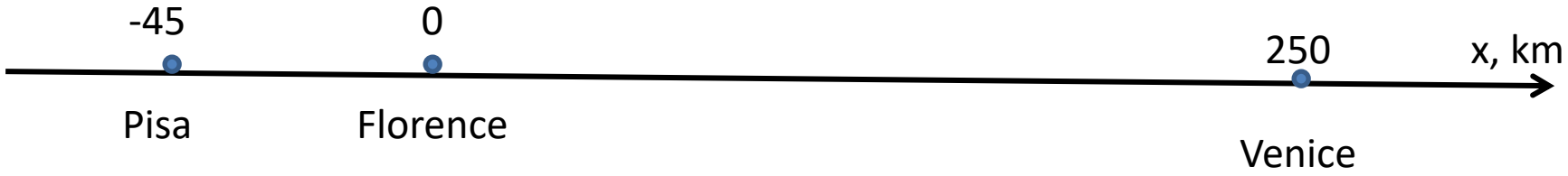
v is the constant velocity (can be positive or negative)

Homework

Problem 1

While on vacation in Pisa, Italy, James Bond learns that a villain named Dr. Nope from Venice is about to purchase a secret and deadly weapon code-named Big Mac. It is to be sold by certain Merchant based in the city of Florence. Florence is on the way between Pisa and Venice, distance from Florence to Pisa is d_1=45 km, and from Florence to Venice is d_2=250 km. Both the Merchant and Dr. Nope want to meet and finish the deal as soon as possible.

As a result, all three of them get to their cars. Dr. Nope starts from Venice and drives towards Florence with average speed v_1=120 km/hr. At the very same moment, the Merchant (from Florence) and James Bond (form Pisa) start driving towards Venice. The Merchant's speed is s_2 = 130 km/hr.



a) How much time will it take for Dr. Nope and the Merchant to meet, if Bond is detained by Italian Police for speeding? To solve this part, write Equations of Motion for Dr. Nope and the Merchant.

b) In fact, James Bond did escape from the police chase. What must be Bond's average speed to ensure that all three of them meet at the same point (to have prolonged fight with shooting and special effects)? You will need to write Equation of motion for James Bond.

c) Plot the coordinate x of all three characters versus time, t.

Problem 2.

A school bus leaves the stop at time t=0s and drives towards the school with speed v_1=10m/s. A student arrives to the stop T=30s late. He runs to school with average speed v_2=3m/s.

a) Write down equation of motion for both the bus and the student. Don't forget to sketch the picture and show your choice of coordinate system.
b) From your equations, determine how much later the student will reach the school if the distance from the bus stop to the school is d=2km.