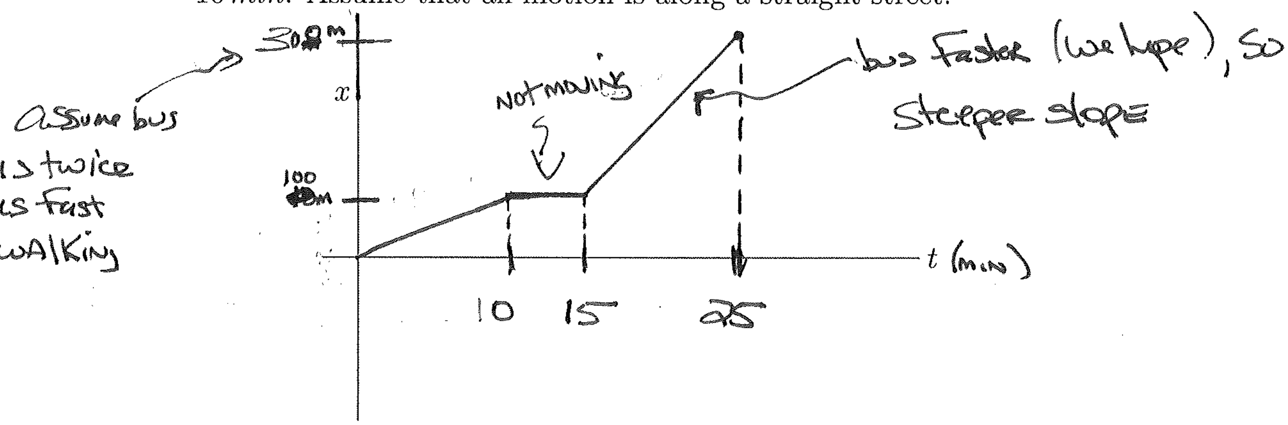
Chapter 2, Sections 2.1-2.2

2.1 - Describing Motion

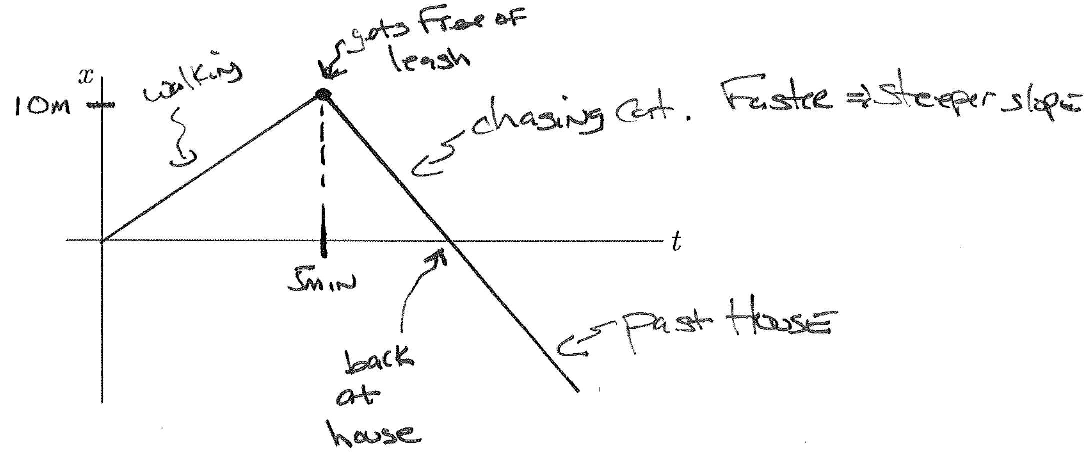
(1.) Sketch position-versus-time graphs for the following motions. Include a numerical scale on both axes with units that are reasonable for the motion. Some numerical information is given in the problem, but for other quantities, make reasonable estimates. For simplicity, assume all speeds are constant.

(a) A student takes 10 *min* to walk to the bus stop. She waits 5 *min* for the bus. She gets on the bus and arrives at campus after another 10 *min*. Assume that all motion is along a straight street.

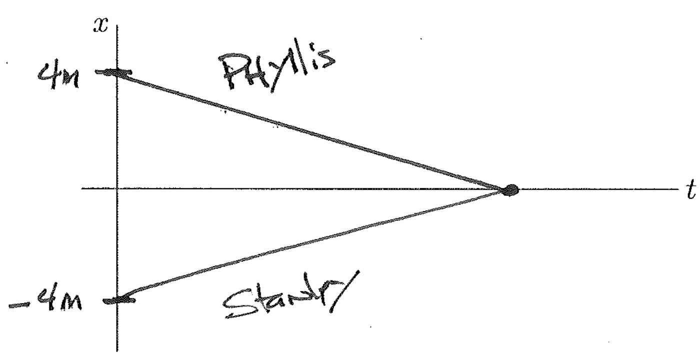


ON GRAPHS, WE put total ELAPSED TIME. WALKING 10 min AND WAITING 5 MIN IS 15 min total. TEN MORE MINUTES ON A bus MEANS 25 min total.

(b) A man leaves his house and slowly walks his dog down the street. The dog spies a cat, yanks the leash out of his owner's hands, and runs after the cat back towards the man's house. Assume the dog runs past the man's house. Here, plot the *dog's* position.

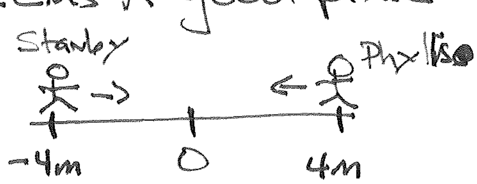


(c) Two lovers run towards each other and hug. Please name each member of your happy couple and label their graphs.



THIS ONE HAS SAME AMbiguity to it. If we ASSUME THEY RUN TOWARDS EACH OTHER WITH EQUAL SPEEDS, THEY will Meet IN THE MIDDLE, SO THAT SEEMS A good place to put ZERO.

ASSUME THE Following:



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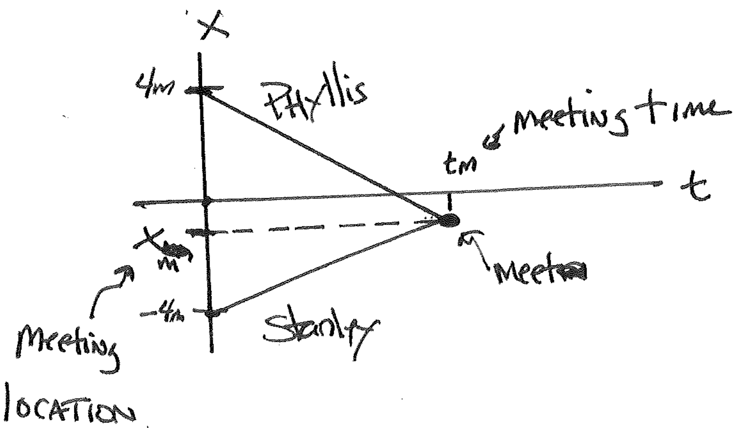
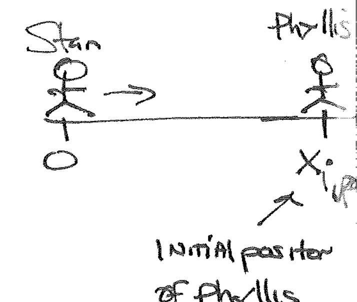
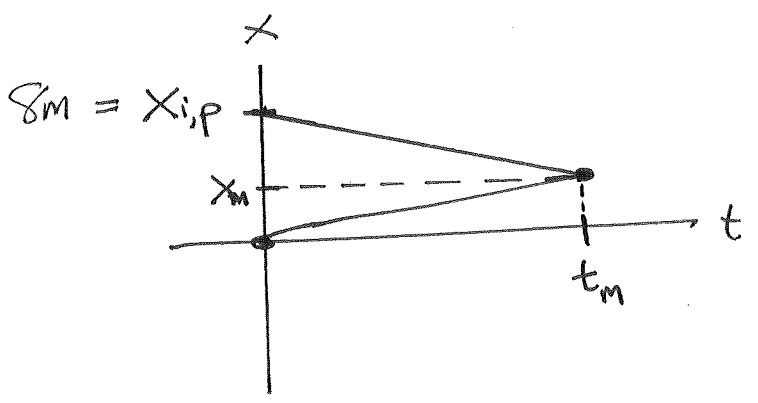
IF Phyllis RUNS FASTER THAN Stanley THEN THEY MEET SOMEWHERE to THE LEFT OF THE ORigin SINCE Phyllis CAN COVER MORE distANCE.

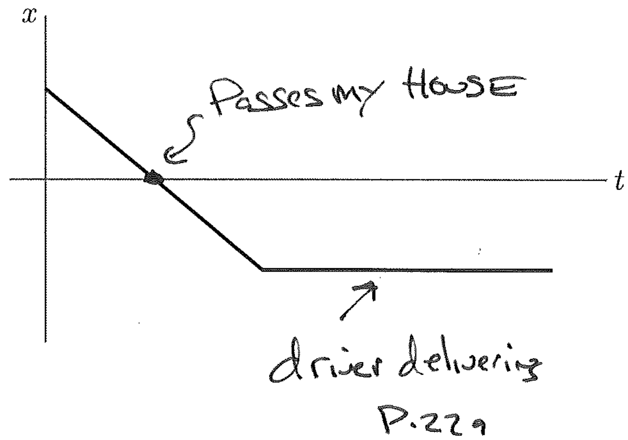


IF you INSTEAD Put the ORigin at Stanley





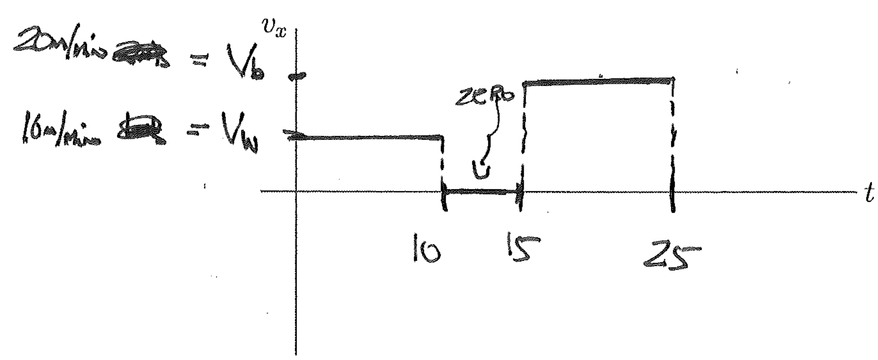
(2.) For the following position-versus-time graph write a one or two sentence "story" about a real object or objects that would have this graph.



Put My House at origin.
A Pizza delivery car starts to the right of my House. Dashes my hopes by going past my House to the Neighbor, 3 Houses DOWN. It then stays there as driver delivers the pizza

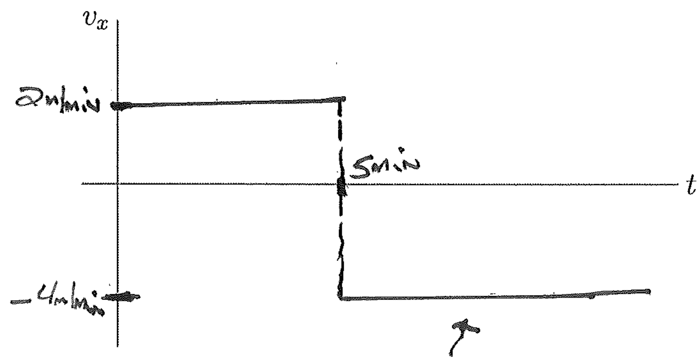
(3.) Sketch *velocity-versus-time* graphs for the following motions. Include a numerical scale on both axes with units that are reasonable for the motion. Use the same time values as in your previous problems.

(a) A student takes 10 *min* to walk to the bus stop. She waits 5 *min* for the bus. She gets on the bus and arrives at campus after another 10 *min*. Assume that all motion is along a straight street.



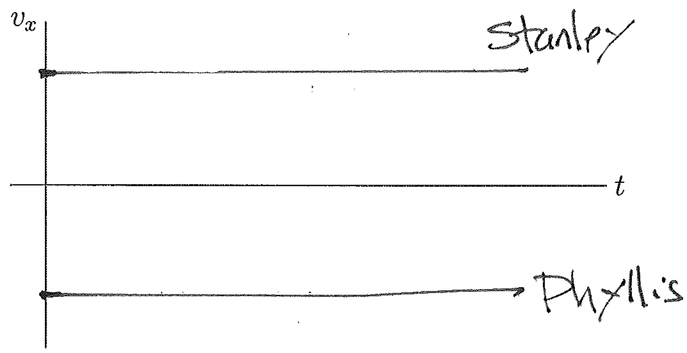
AGAIN, Assume bus is twice as fast as walking. while waiting, velocity is ZERO. walking AND Bus both in SAME direction ⇒ both positive

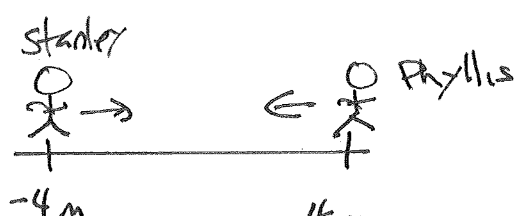
(b) A man leaves his house and walks his dog down the street. The dog spies a cat, yanks the leash out of his owner's hands, and runs after the cat back towards the man's house. Assume the dog runs past the man's house. Again, let's think about the dog.



when dog gets free, he goes faster AND IN opposite directions ⇒ MORE Negative Number

(c) Two lovers run towards each other and hug. Please use the same names as in the previous problem.

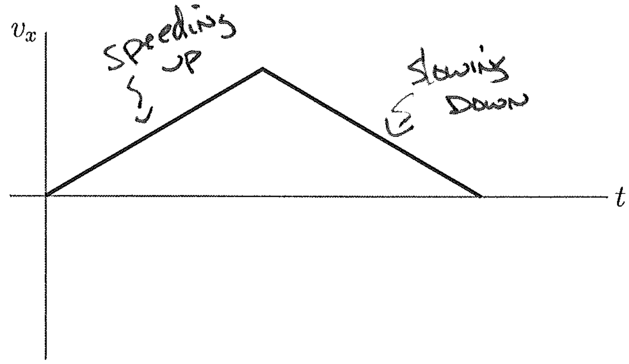




Stanley RUNS to Right with Constant Speed.

Phyllis RUNS to left ⇒ Stanley has positive velocity AND Phyllis has Negative

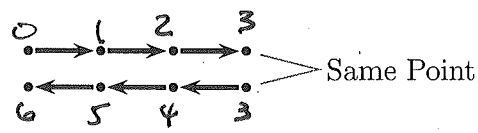
(4.) For the following velocity-versus-time graph write a one or two sentence "story" about a real object or objects that would have this graph.



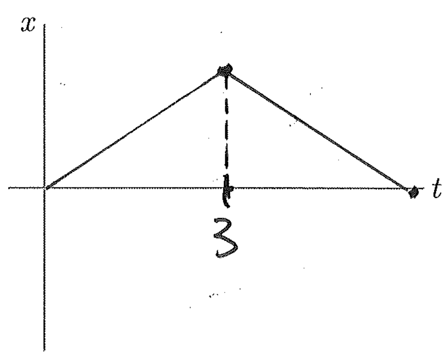
A Pizza Delivery car starts from rest at a stoplight. It speeds up when light turns green. It then slows down for next light and stops again.

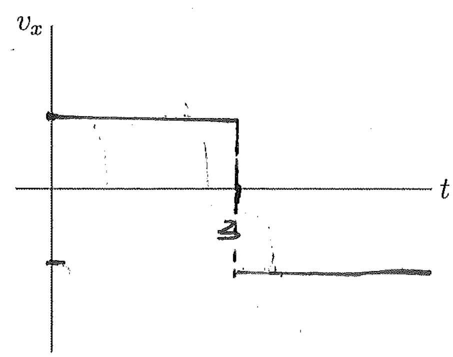
(5.) For the following motion diagram, sketch the corresponding position-versus-time and velocity-versus-time graphs.

Motion Diagram:



Something goes to Right with Constant Speed. It then turns Around And comes back to where it started





2.2 - Uniform Motion

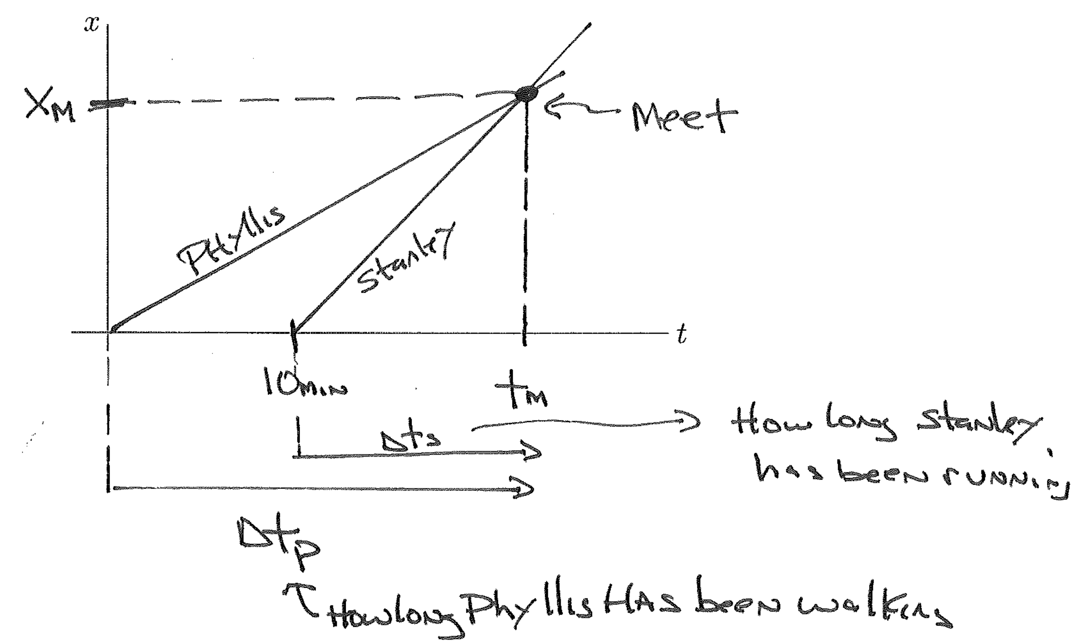
(1.) Phyllis leaves her house early in the morning to go to work at the University of New Mexico. She walks down the street with constant speed of $1.3\,m/s$. 10 minutes after Phyllis leaves the house, her husband, Stanley, discovers that Phyllis forgot her lunch. He runs after her going $2.7\,m/s$.

(a) Sketch the position-versus-time graph for Phyllis's and Stanley's motion.

(b) How long has Phyllis been walking when Stanley catches up to her?

(c) How far from their house will they be when Stanley catch Phyllis?

When $x_p = x_M$ AND $x_S = x_M$ they meet



THESE TWO tell us THAT Stanley HAS been moving for 10 minutes less AND

$$\Delta t_S = \Delta t_P - 10\,min$$

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For stanley: $V_s = \frac{\Delta X_s}{\Delta t_s}$, $\Delta X_s = X_M - 0$ ← starts From home (Meeting Point ↓ X_M)

$= X_M$

$\Rightarrow 2.7 m/s = \frac{X_M}{\Delta t_p - 10 min}$ ← Have mixed up units, So Convert

$10 min \times \frac{60 s}{min} = 600 s$

$\Rightarrow 2.7 m/s = \frac{X_M}{\Delta t_p - 600 s}$

For phyllis: $V_p = \frac{\Delta X_p}{\Delta t_p}$ $\Delta X_p = X_M - 0$ Since she Also starts From home AND ENDS at the SAME MEETING Point

$\Rightarrow 1.3 m/s = \frac{X_M}{\Delta t_p}$

THEY MEET AT THE SAME place $\Rightarrow$ Solve both EQUATIONS for X_M AND SET EQUAL.

For Stanley: $X_M = 2.7 m/s(\Delta t_p - 600 s) = 2.7 m/s \Delta t_p - 1620 m$

For Phyllis: $x_m = 1.3\,m/s\,\Delta t_p$

so $2.7\,m/s\,\Delta t_p - 1620\,m = 1.3\,m/s\,\Delta t_p$

$\Rightarrow 2.7\,m/s\,\Delta t_p - 1.3\,m/s\,\Delta t_p = 1620\,m$

$\Rightarrow (2.7\,m/s - 1.3\,m/s)\,\Delta t_p = 1620\,m$

$(1.4\,m/s)\,\Delta t_p = 1620\,m$

$\Rightarrow \Delta t_p = \dfrac{1620\,m}{1.4\,m/s} = 1157\,s = 1160\,s$ (3 sig figs)

So finally $x_m = (1.3\,m/s)\,\Delta t_p = (1.3\,m/s)(1157\,s) = 1504\,m$

$= 1500\,m$

↗

only 2 sig figs

but good looking

answer