

PAL Problem Set 5 for Phys 5A (Motion in 1D Graphs)

Always explain your answers and show your work.

Motion with constant speed

For each of the three motions described below,

- Draw a motion diagram;
- Draw a position vs. time diagram (label the curve for each student);
- Draw a velocity vs. time diagram (label the curve for each student);

Student 1 starts at the origin and moves in the positive x-direction with constant speed v .

Student 2 starts at a positive initial position (call it x_{2i}) and moves with constant speed v towards the origin.

Student 3 starts at a negative initial position (call it x_{3i}) and moves with constant speed $v/2$ towards a positive final position.

Motion with changing speed

For each of the two motions described below,

- Draw a motion diagram;
- Draw a position vs. time diagram (label the curve for each student);
- Draw a velocity vs. time diagram (label the curve for each student);

Student 4 starts at the origin and speeds up at a constant rate towards a positive x_{f4} position.

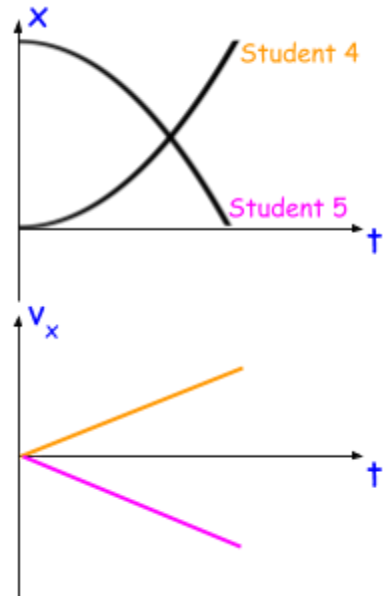
Student 5 starts at a positive x_{i5} position that is equal to the final position of student 4 $x_{i5} = x_{f4}$ and slowly speeds up towards the origin. Students 4 and 5 have the same final speed (hint: same speed doesn't necessarily mean the same velocity)



Motion diagram for student 4



Motion diagram for student 5



About the position vs. time graph:

Note the initial positions of each student - student 4 starts at $x_{4i} = 0$, student 5 starts at a positive position. The final positions are reversed - student 4 ends where student 5 starts and vice-versa.

The position graphs must be parabolas because the speed of both students is constantly changing.

About the velocity vs. time graph:

Both students start from rest. The speed of both increases constantly (i.e., linearly).

Student 4 is moving in the positive direction so their velocity is always positive.

Student 5 is moving in the negative direction so their velocity is always negative.