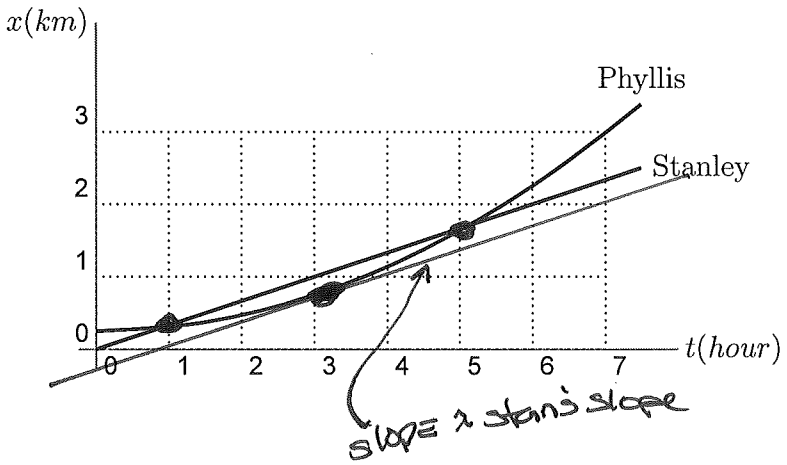
# CHAPTER 2, SECTIONS 2.3-2.4

## 2.1 - Instantaneous Velocity

(1.) The position-versus-time graphs for two people, Phyllis and Stanley, are shown below.

(a) Are the Phyllis and Stanley ever at the same place? If so, at what time or times does this happen?

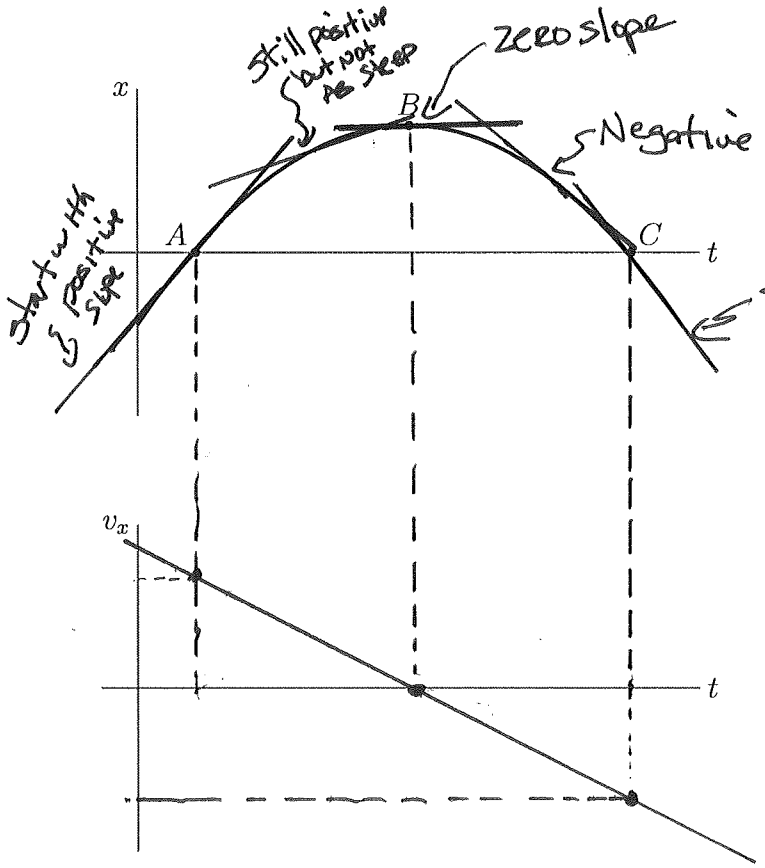
(b) Do Phyllis and Stanley ever have the same velocity? If so, at what time or times does this happen?




AT SAME PLACE ⇒ SAME POSITION ⇒ WHERE GRAPHS CROSS, SO AT $t=1$ hour AND $t=5$ hour.

SAME VELOCITY ⇒ SAME SLOPE. Stan's GRAPH IS STRAIGHT LINE ⇒ CONSTANT SLOPE. Phyllis SPEEDING UP, SOMETIME AROUND $t=3h$, SLOPES ARE THE SAME.

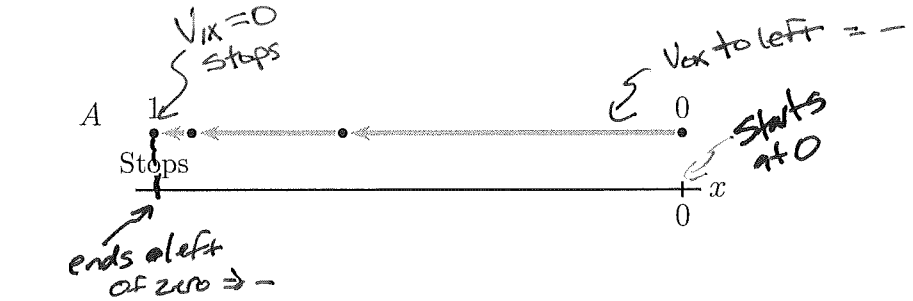
(2.) For the following position-versus-time graph draw the corresponding velocity-versus-time graph. For the points labeled $A$, $B$, and $C$ draw dashed vertical lines to help connect the position $x$ at time $t$ with the corresponding velocity $v_x$ at the same time $t$. There are no numbers, but your graph should correctly indicate *relative* speeds.



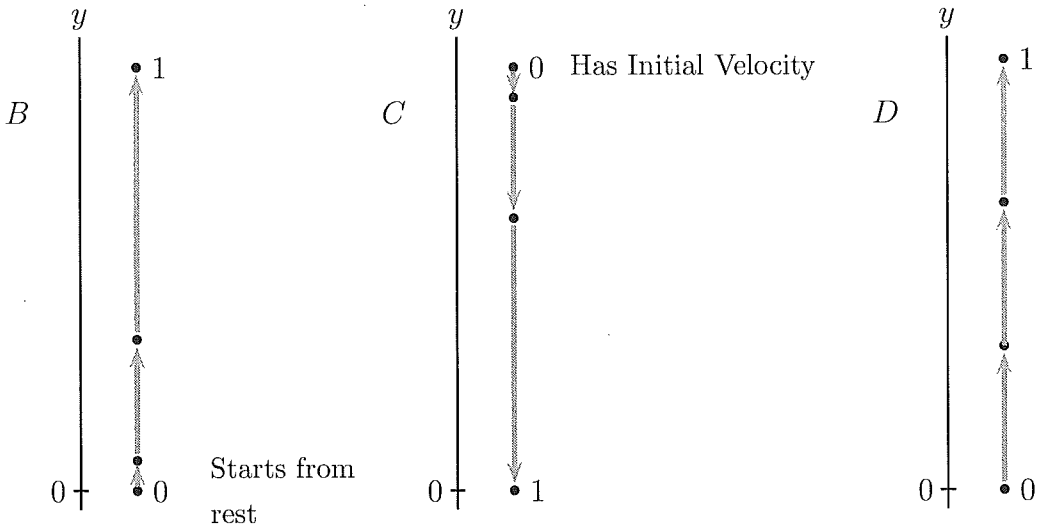

So: Velocity begins positive at A AND goes DOWN to zero at B. At C, it HAS BECOME Negative. GIVEN the NICE "SYMMETRY" OF THE CURVE, the velocity at C IS SAME MAGNITUDE as velocity at A. Connecting Dots, we also FIND Velocity IS A STRAIGHT LINE

## 2.4 - Acceleration

(1.) The motion diagrams below show objects undergoing constant acceleration motion. The diagrams also have labeled an initial point 0 and a final point 1. Determine whether the initial position, final position, initial velocity, final velocity, and acceleration values are positive, negative, or zero. Give your answers by writing $+$, $-$, or 0 in the table below.

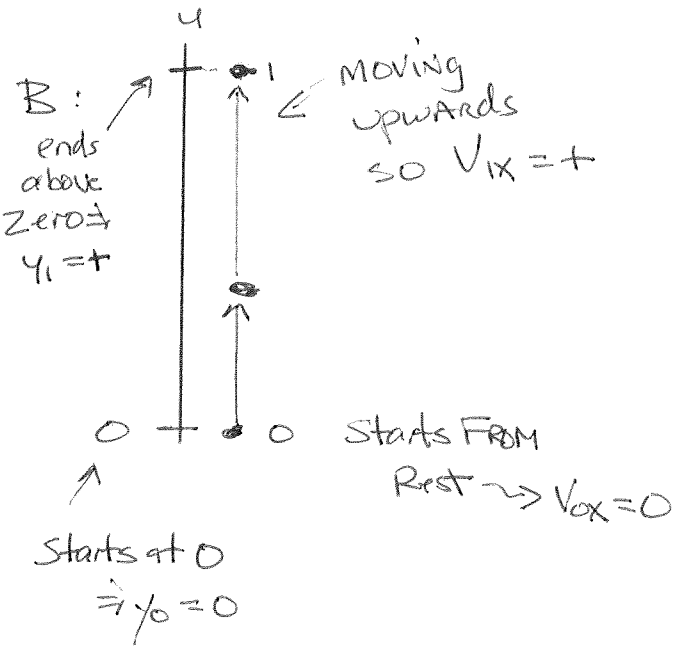



Speed is decreasing so acceleration opposite to velocity ⇒ $a_x = +$




| | $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|---|
| $x_0$ or $y_0$ | 0 | 0 | + | 0 |
| $x_1$ or $y_1$ | − | + | 0 | + |
| $v_{0x}$ or $v_{0y}$ | − | 0 | − | + |
| $v_{1x}$ or $v_{1y}$ | 0 | + | − | + |
| $a_x$ or $a_y$ | + | + | − | 0 |

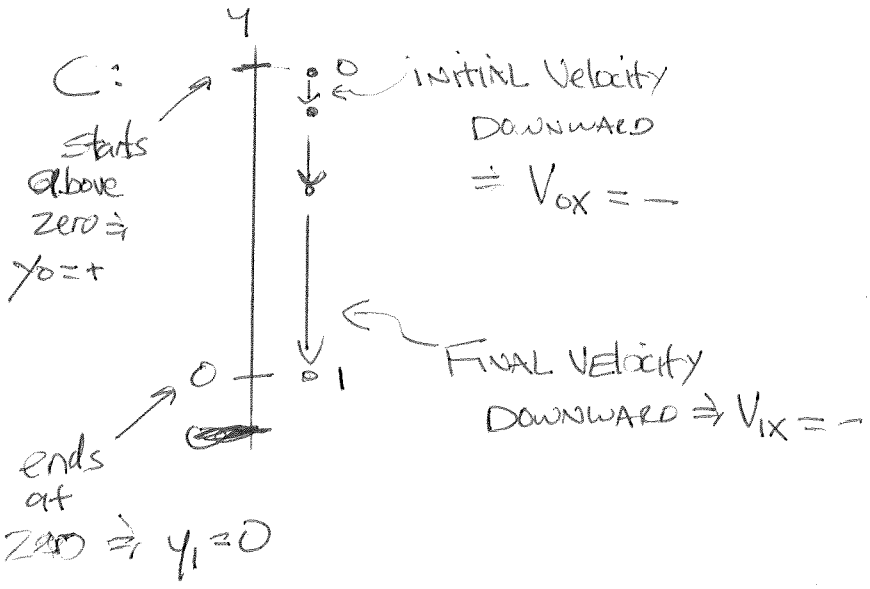
B, C, D on next page




Arrows getting longer ⇒ SPEED IS INCREASING

⇒ Acceleration SAME AS Velocity

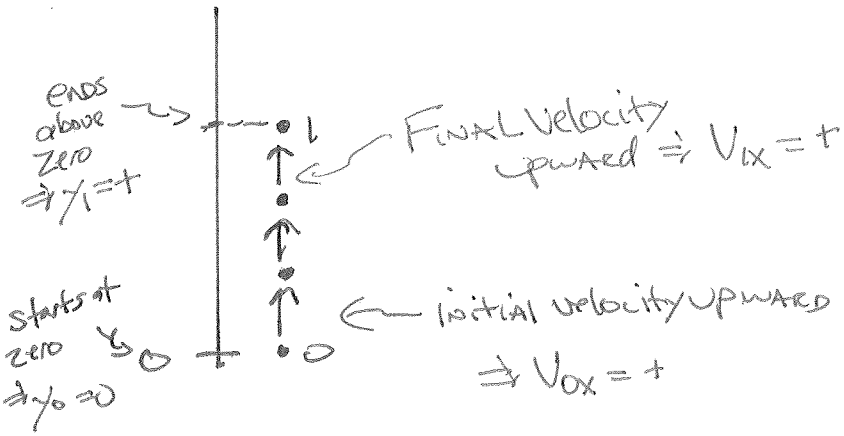
⇒ $a_x = +$




ARROWS getting longer

⇒ INCREASING SPEED

⇒ ACCELERATION SAME AS Velocity ⇒ $a_x = -$




Arrows ALL SAME LENGTH ⇒ NO Acceleration ⇒ $a_x = 0$