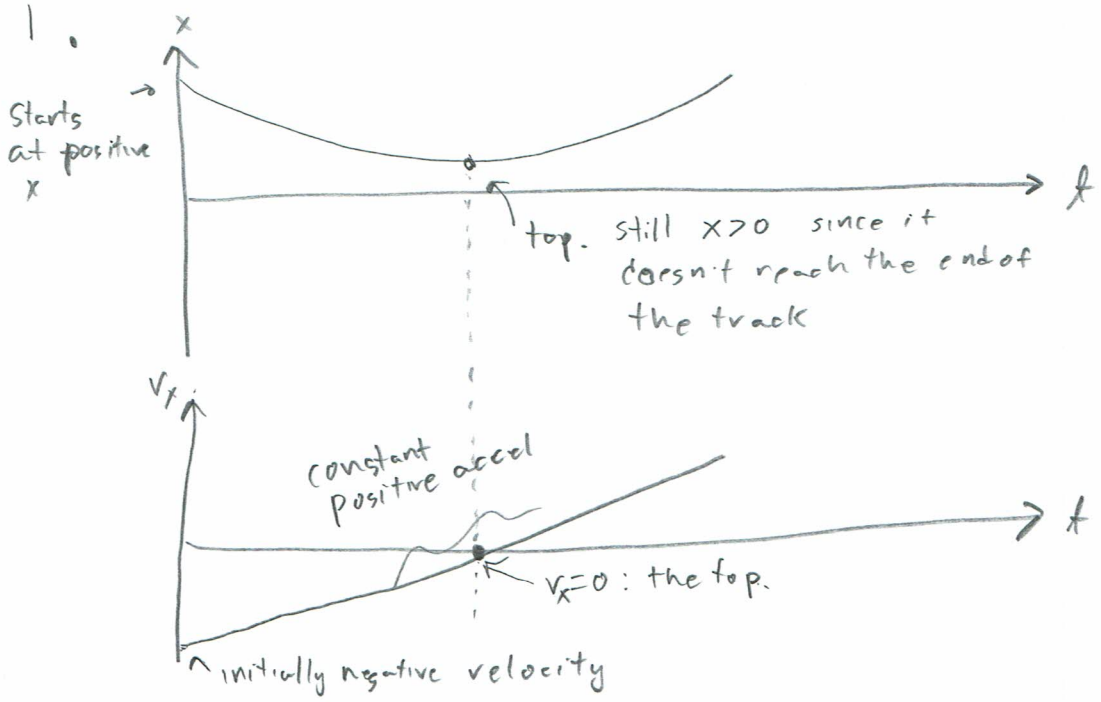
1.

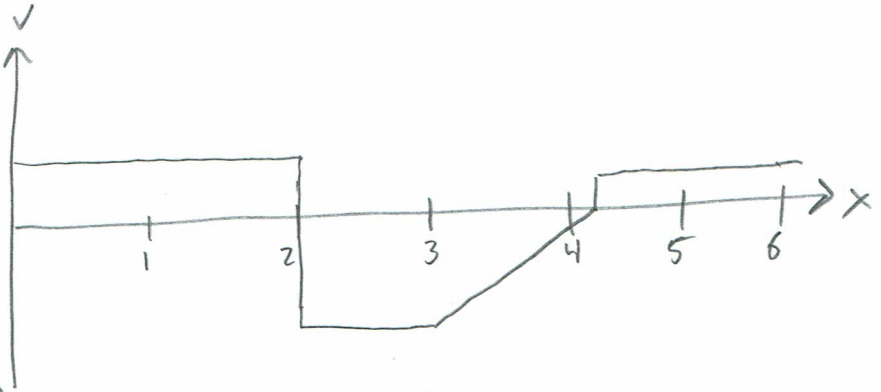


2. a) Since the x vs. t graph is linear from t=2 to t=3, just find the slope - that will be the inst. velocity at t=2.5s.

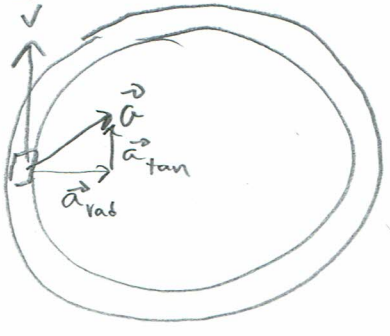
$$v_{2.5s} = v_{avg,\,2-3s} = \frac{x_3 - x_2}{3s - 2s} = \frac{2m - 6m}{1s} = -4\,m/s$$

b) $$v_{avg,\,1-3s} = \frac{x_3 - x_1}{3s - 1s} = \frac{2s - 4s}{2s} = -1\,m/s$$

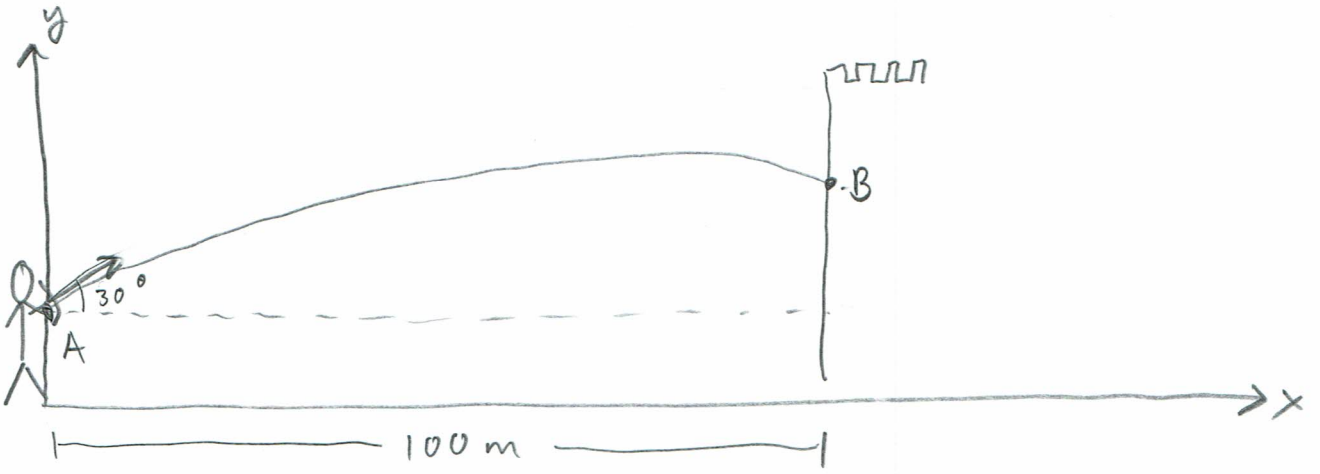
c)

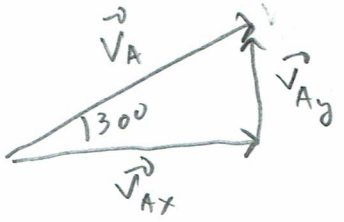


3.



$\vec{a}_{tan}$ is in the same direction as $\vec{v}$ since the car is speeding up. $\vec{a}_{rad}$ is towards the center of the circle as always.





$V_{Ax} = V_A \cos 30° = 150\ m/s \cdot \sqrt{3}/2 = 129.9\ m/s$

$V_{Ay} = V_A \sin 30° = 150\ m/s \cdot \frac{1}{2} = 75\ m/s$

$x_A = 0\ m \quad x_B = 100\ m, \quad y_A = 1.50\ m$

$a_{AB,x} = 0\ m/s^2 \quad a_{AB,y} = -g$

Use x-motion (const. vel.) to find Δt_{AB}:

$$x_B = \cancel{x_A}^{\,0} + V_{Ax}\,\Delta t_{AB}$$

$$\Delta t_{AB} = \frac{x_B}{V_{Ax}} = \frac{100\ m}{129.9\ m/s} = 0.770\ s$$

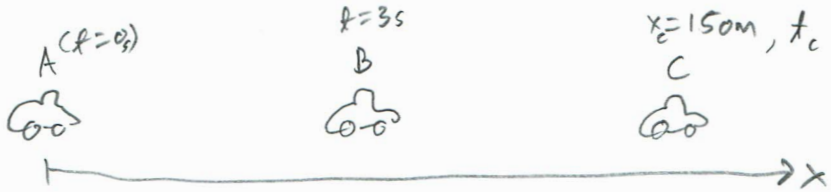
Use y-motion to find y_B: It is const accel $= -g$.

$$y_B = y_A + V_{Ay}\,\Delta t_{AB} - \tfrac{1}{2} g (\Delta t_{AB})^2$$

$$= 1.5\ m + \left(75 \tfrac{m}{s}\right)(0.770\ s) - 4.9 \tfrac{m}{s^2}(0.770\ s)^2$$

$$= 56.3\ m \qquad \text{(A tall wall!)}$$

5.



$x_A = 0\,m$ $x_B = ?$ $x_C = 150\,m$

$v_{Ax} = 30\,m/s$ $v_{Bx} = 30\,m/s$ $v_{Cx} = ?$

const v from A to B

$a_{AB,x} = 0\,m/s^2$ $a_{BC,x} = ?$

$t_A = 0s$ $t_B = 3s$ $t_C = 7s$

First find x_B using const velocity from A to B:

$$x_B = \cancel{x_A^{0}} + v_{Ax}\,\Delta t_{AB}$$

$$x_B = (30\,m/s)(3s) = 90\,m$$

(so $\Delta x_{BC} = 150m - 90m = 60m$)

Now since we have const accel from B to C:

$$x_C = x_B + v_{Bx}\,\Delta t_{BC} + \frac{1}{2}a_{BC,x}(\Delta t_{BC})^2$$

$$\Rightarrow \frac{2(x_C - x_B - v_{Bx}\Delta t_{BC})}{\Delta t_{BC}^2} = a_{BC,x} = \frac{2(150m - 90m - 30\,m/s\,(4s))}{(4s)^2}$$

-7.5

$= \cancel{XXXXXX}\ m/s^2$

(negative b/c it is accelerating in the negative direction).