Phys100 Assignment Cover Sheet

First Name:_____   Last Name:_____   Mark:_____

Student ID:_____   Computing ID:_____   Date:_____

Phys100 Written Assignment #3

Due Wed Jan 31, 2007, 9:00AM

. A pedestrian is running at his maximum speed of 6.0 m/s to catch a bus stopped by a traffic light. When he is 20 metres from the bus, the light changes and the bus accelerates uniformly at 1.0 m/s^2. By use of an x-t graph find either (a) how far he has to run to catch the bus or (b) his "frustration distance" (closest approach). Do not use a graphing calculator.

[Solution]. Written Assignment #3. (Phys 100. Spring 2007)

Set up coordinate system.

$v = 6 \text{ m/s}$ $a = 1 \text{ m/s}^2$

0 20 m x
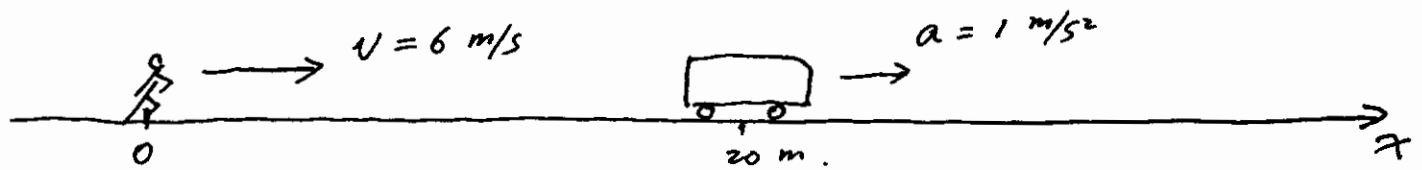
Given: Pedestrian: $a_P = 0$, $v_P = 6.0 \text{ m/s} = \text{constant}$. $x_{P0} = 0$

Bus: $a_B = 1 \text{ m/s}^2$, $v_{B0} = 0$, $x_{B0} = 20 \text{ m}$.

at any time t:

Position of Bus: $x_B = x_{B0} + \frac{1}{2} a_B t^2 = 20 + \frac{1}{2} t^2$

Position of Pedestrian: $x_P = v_P \cdot t = 6t$.

Plot $x_B - t$ and $x_P - t$ on the same graph.

Also plot $v_B - t$ and $x_P - t$ on the same graph.

at $t = 6 s$,

$x_B - x_P$ is the smallest.

also, $v_B = v_P$.

i.e. when $t > s$, $v_B > v_P$.

the Bus will move faster than the person.

Frustration distance: (at $t = 6s$)

$x_B - x_P = 20 + \frac{1}{2}(6^2) - 6(6) = 2.0 \text{ m}$.