Answer of question #78002-Physics- Mechanics - Relativity

A particle moving in a straight line with constant acceleration passes in succession A,B,C. The time taken from A to B is t and from B to C is 2t, AB = a, BC = b. Prove that the acceleration is (b-2a)÷(3t^2) and find the velocity at B. Assuming the initial velocity equals to u.

Input Data:

$Distance_1$: $AB =$ a;

$Distance_2$: BC = b;

$Time_1$: $t_1 = t$;

$Time_2$: $t_2 = 2t$;

$Acceleration$: e;

$Initial\ velocity$: u;

Solution:

According to the equation of motion, the distances will be:

$$a = ut_1 + \frac{et_1^2}{2};$$

$$b = vt_2 + \frac{et_2^2}{2};$$

where ***v*** is the speed reached at point ***B***:

$$v = u + et_1 = u + et;$$

Hence the distance ***b*** after substitution of the initial data is equal to:

$$b = 2t(u + et) + \frac{4et^2}{2} = 2ut + 4et^2;$$

Distance ***a*** is equal:

$$a = ut + \frac{et^2}{2};$$

We multiply the distance ***a*** by 2 and subtract from distance ***b***, as indicated in the condition. We obtain the following equation:

$$b - 2a = 2ut + 4et^2 - 2ut - et^2;$$

$$b - 2a = 3et^2;$$

Hence the acceleration is equal to:

$$e = \frac{b - 2a}{3t^2}$$

Answer:

Velocity at ***B***:

$v = u + et;$

Acceleration:

$e = \frac{b-2a}{3t^2}$, Q.E.D.