Solutions for Homework14

Emre Arapcic-Uvak
Vedad Siljic

Abstract

In this document we will show the solutions for problems represented in the given homework for this week.

Contents

1 Task 1

1.1 Problem

In the given graph which represents the movement of a car, answer the following:

- Between which point and point the car accelerate, and between which points it decelerate?
- What is the distance traveled at point C? and what is it at point F?
- Indicate line segments with 0 acceleration, does that mean the car is not moving? Explain.
- What are the values of acceleration and deceleration of the car at each segment?

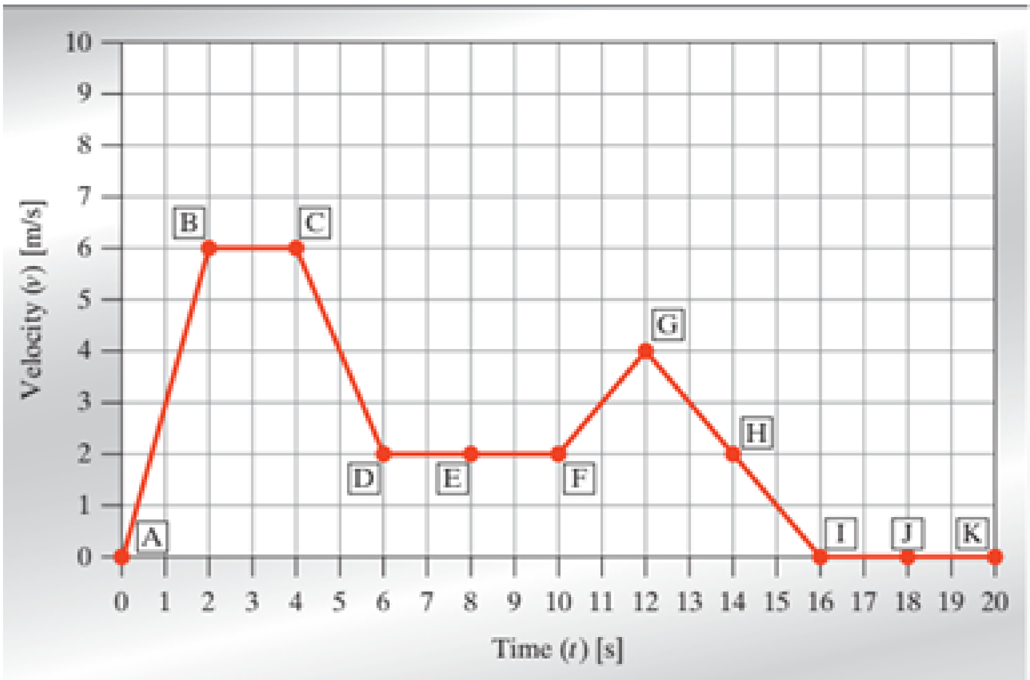

Figure 1: Velocity-Time of the car

1.2 Solution

1. The car accelerates at points:
   - $A \rightarrow B$
   - $F \rightarrow G$

   And it decelerates at points:
   - $C \rightarrow D$
   - $G \rightarrow I$ ($G \rightarrow H$ & $H \rightarrow I$)

2. To get the distance we can just find the integral from point A (0) to whatever points we want. So to see what the distance traveled at point C is we just have to evaluate

$$\int_A^C v * dt = \int_A^B v * dt + \int_B^C v * dt$$

which is just the area under the graph so from $A \rightarrow B$ we have a right triangle with sides 1×6 which means that the area from that triangle is $\frac{6}{2} = 3$, and from $B \rightarrow C$ we have a rectangle with sides

2×6 so in total the area of the rectangle is 12 meaning that the distanced traveled from $A \to C$ is $3 + 12 = 15m$. To find out the distance traveled from $A \to F$ we have to solve the following integral:

$$\int_A^F v * dt = \int_A^C v * dt + \int_C^B v * dt + \int_D^F v * dt$$

Since we already know that $\int_A^C v * dt = 15m$ we just have to find the other two integrals, which at the end end up being $15 + \frac{2*4}{2} + 2*2 + 2*4 = 15 + 4 + 4 + 8 = 31m$

3. The line segments with 0 acceleration are
   - $B \to C$
   - $I \to K$ ($I \to J$ & $J \to K$)

   This does NOT mean that the car isn't moving, this just means that the velocity of the car isn't changing or in other words
   $$\frac{dv}{dt} = 0$$

4.

Line Segment	Acceleration value $\left[\frac{m}{s^2}\right]$
$A \to B$	3
$B \to C$	0
$C \to D$	-2
$D \to E$	0
$E \to F$	0
$F \to G$	1
$G \to H$	-1
$H \to I$	-1
$I \to J$	0
$J \to K$	0

2 Task 2

2.1 Problem

2.2 Solution

3 Task 3

3.1 Problem

3.2 Solution

4 Task 4

4.1 Problem

4.2 Solution

5 Task 5

5.1 Problem

5.2 Solution

6 Task 6

6.1 Problem

6.2 Solution

7 Task 7

7.1 Problem

7.2 Solution

8 Task 8

8.1 Problem

8.2 Solution

9 Task 9

9.1 Problem

9.2 Solution

10 Task 10

10.1 Problem

10.2 Solution