Graphs for Uniform Acceleration- Graphing Package #2

Using Position-Time graphs to find Acceleration.

Problem : Jennifer sprints and accelerates from rest to her top speed in 8.0 seconds with a displacement of 20 m [E]. Table 2 contains the position-time data from the starting position. Graph Jennifer's position-time data

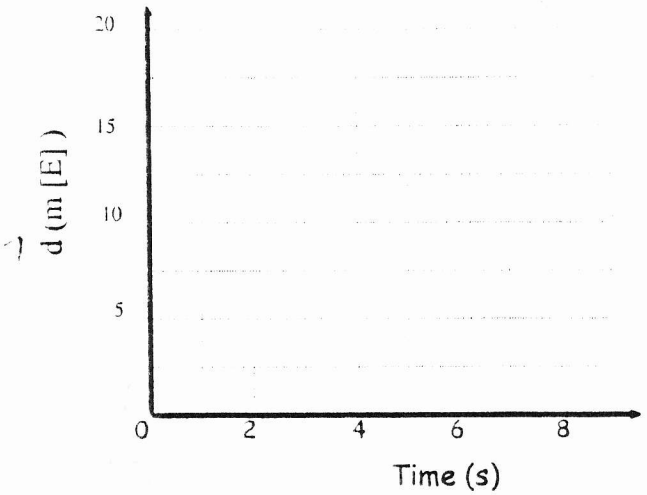


Table :

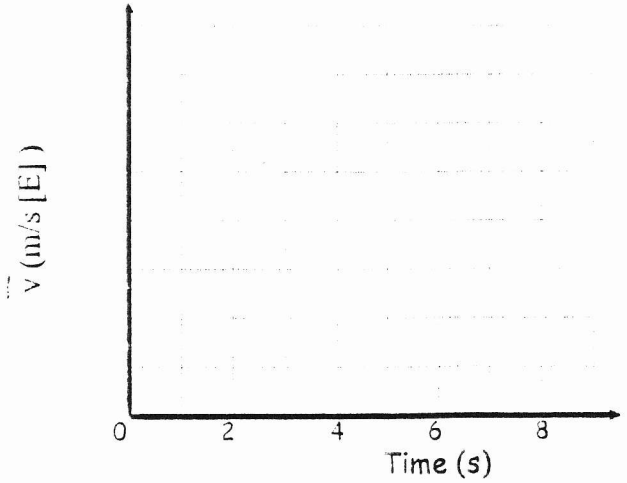
t (s)	$\vec{d}$ (m [E])
0.0	0.00
2.0	1.25
4.0	5.00
6.0	11.25
8.0	20.00

What can you conclude about position-time graphs of objects that accelerate uniformly? What is their shape? Write a concluding sentence below.

When an object accelerates uniformly the position-time graph...

Recall: The slope of a position time graph yields velocity. If the slope of the line on the position-time graph is gradually increasing, the velocity is also gradually increasing hence undergoing acceleration. **To find the slope of a curved line at a particular instant we draw the tangent at that instant. The slope of the tangent at that instant gives the instantaneous velocity at that instant.**

Produce Jennifer's velocity-time graph below.



Show your calculations here:

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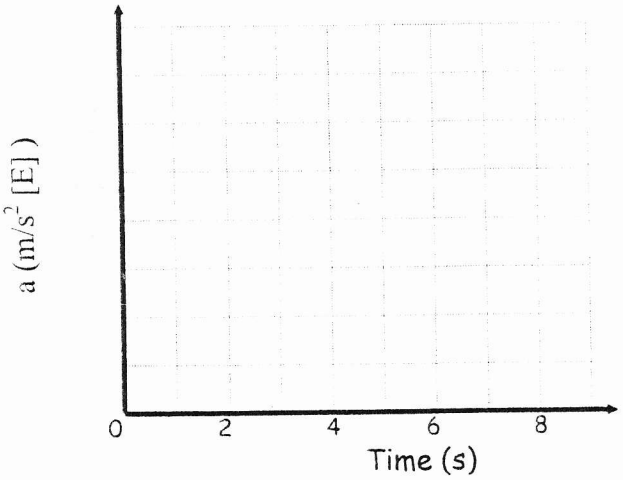
Write a concluding sentence about velocity-time graphs that undergo uniform acceleration.

When an object accelerates uniformly the velocity-time graph...

The acceleration of Jennifer can be determined from the slope of the velocity-time graph.

$$slope = \frac{rise}{run} = \frac{\overrightarrow{\Delta v}}{\Delta t} = \text{acceleration}$$

Graph Jennifer's acceleration-time graph below.



Show your calculation here:

What additional information can we determine from the velocity and acceleration-time graphs?

Find the area under the velocity-time graph.

Find the area under the acceleration-time graph.

Write a concluding sentence about the relationship between all graphs below.

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Sample Problem: Analyzing a Position-Time Graph for Uniform Acceleration

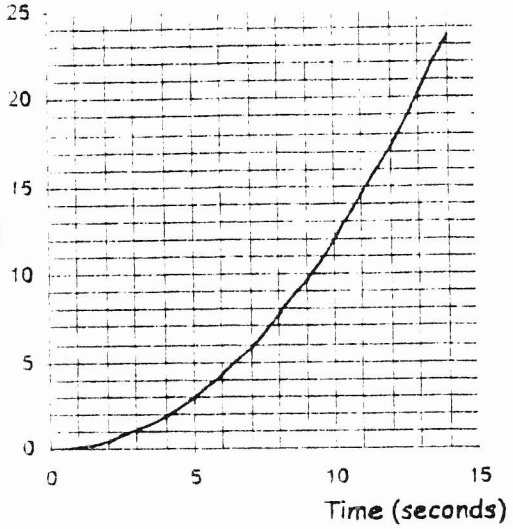
The following position-time graph shows the motion of a car accelerating from rest.

i) Determine the instantaneous velocities at t= 4.0s, 8.0s and 12.0 s.

ii) Plot these velocities on the velocity-time graph and draw a best-fit line.

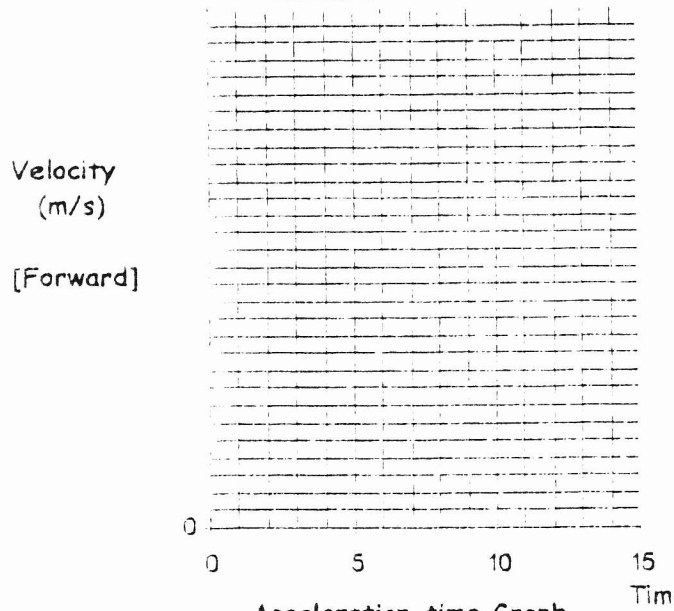
iii) Find the slope of the best-fit line on the velocity-time graph and draw the corresponding acceleration- time graph.

Position-time Graph



Calculations of instantaneous velocities:

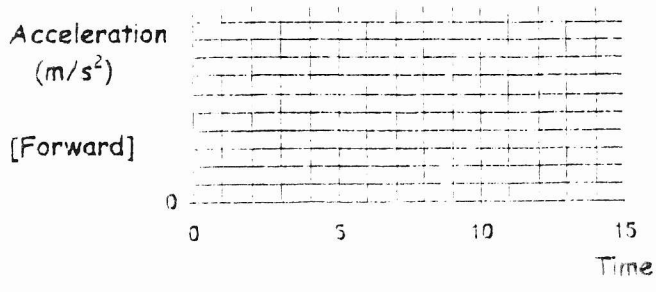
Velocity-time Graph



Points to plot on the velocity -time graph:

Slope calculation to find acceleration:

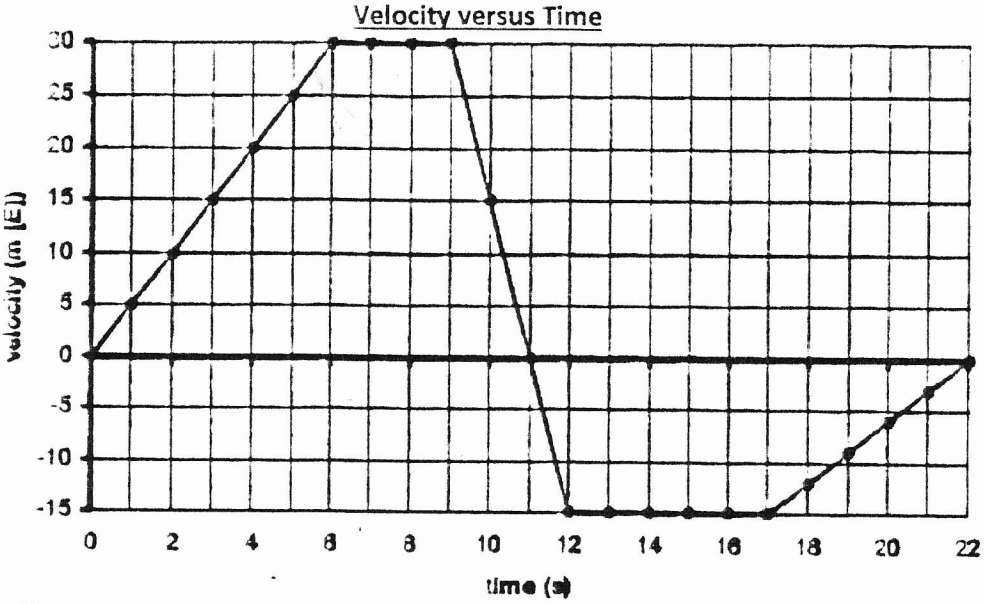
Acceleration-time Graph



Graphs for Uniform Acceleration- Graphing Package #2

SPH3U0 **Analyzing a V-T Graph for Non-Uniform Motion**

The graph below shows the motion of a soccer player running east and west on a field during a play. Use the graph to answer the questions below.



1) What is the velocity at :

4.0 s?	7.0 s?	10.0 s?	14.0 s?	20.0 s?

2) a) Over what time intervals is the player running at a constant velocity?

b) Over what time intervals is the player running east?

c) Over what time intervals is the player running west?

3) **To find acceleration you take the _____ of the v-t graph!**

Determine the acceleration over the following intervals:

0-6.0 s:	**6.0-9.0 s:**	**9.0s -12.0 s:**	**12.0s – 17.0 s:**	**17.0s -22.0s :**

4) **To find the displacement over each time interval, you find the _____ between the graph and the x-axis!**

Find the displacement over each time interval:

0-6.0 s:	**6.0-9.0 s:**	**9.0s -11.0 s:**	**11.0s -12.0 s:**	**12.0s – 17.0 s:**	**17.0s -22.0s :**

5)a) Find the player's resultant displacement. (Hint: Add up all of the displacements!)

b) Find the player's average velocity.