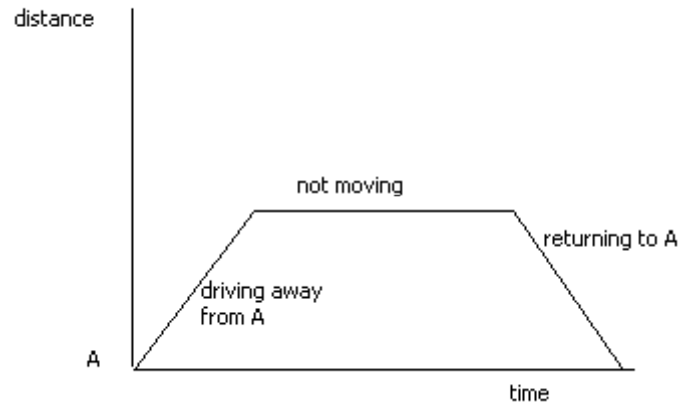
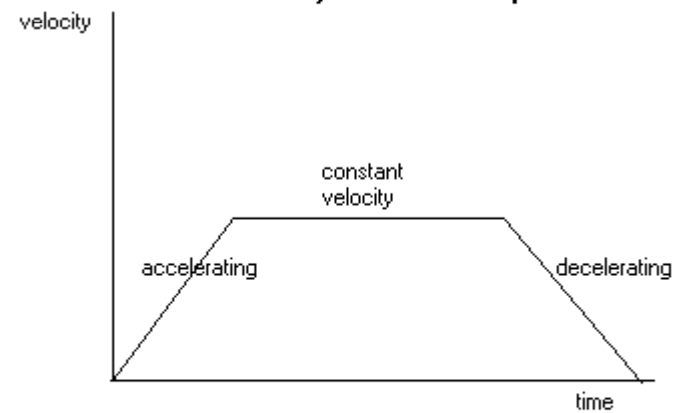


GRAPHICAL ANALYSIS

A Distance - Time Graph



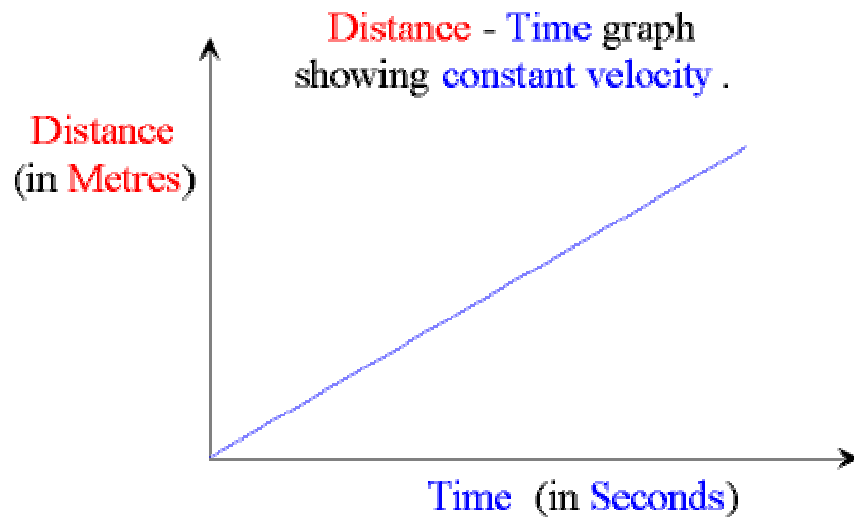
A Velocity - Time Graph



The distance travelled is area under graph.
The acceleration and deceleration can be found by finding the gradient of the lines.

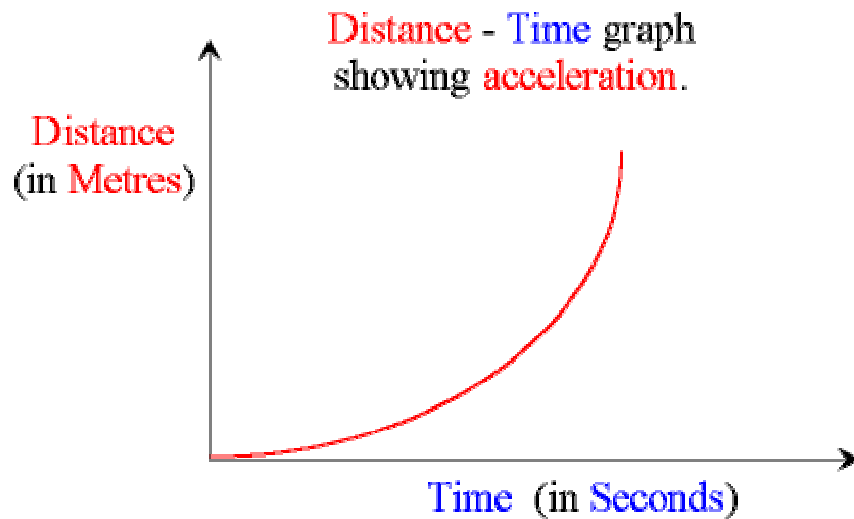
Let's Review

$$\bar{v} = \frac{\Delta x}{\Delta t} = \frac{\text{Rise}}{\text{Run}} = \text{slope} = \frac{\text{meters}}{\text{seconds}} = m / s$$



VELOCITY is the SLOPE of a distance, position, or displacement vs. time graph.

Let's Review



What is the slope doing?

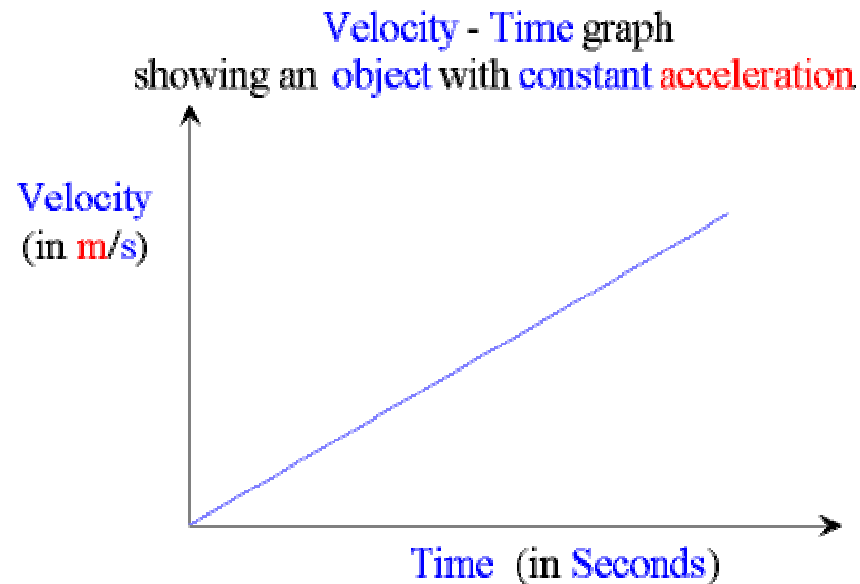
INCREASING

What is the velocity doing?

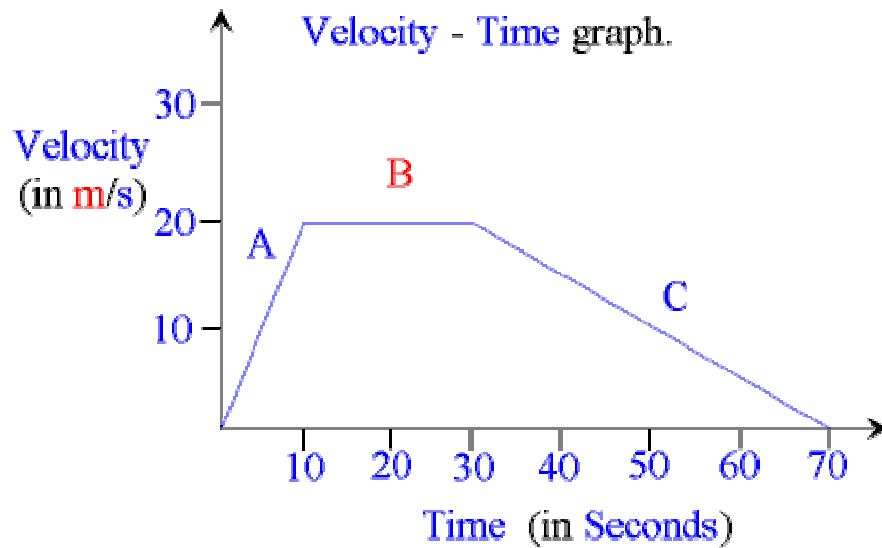
INCREASING

Let's Review

$$a = \frac{\Delta v}{\Delta t} = \frac{\text{Rise}}{\text{Run}} = \text{slope} = \frac{\text{meters/second}}{\text{seconds}} = m / s / s$$



Let's Review



Describe the acceleration during interval A.

The acceleration or SLOPE is constant and positive.

Describe the acceleration during interval B.

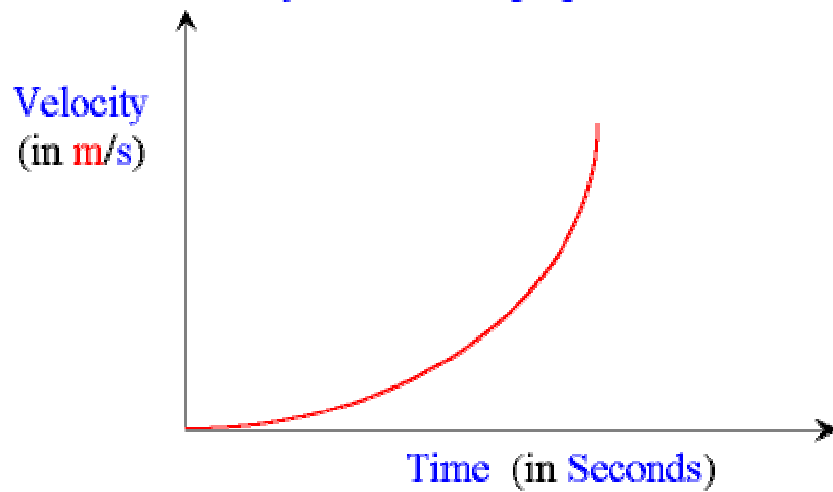
The acceleration or SLOPE is ZERO.

Describe the acceleration during interval C.

The acceleration or SLOPE is constant and negative.

Let's Review

Velocity - Time graph showing
an object with changing acceleration.



What is the acceleration(slope) doing?

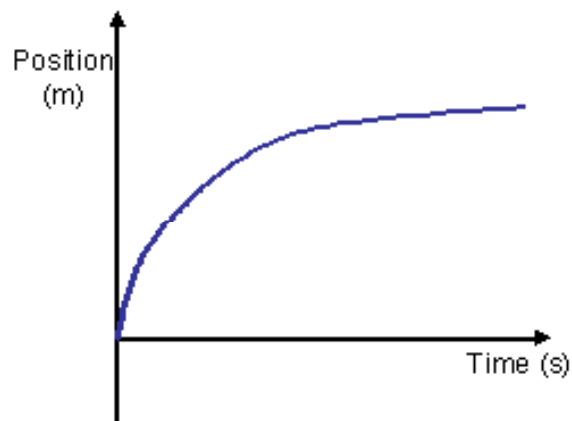
The acceleration is **INCREASING!**

Let's Review

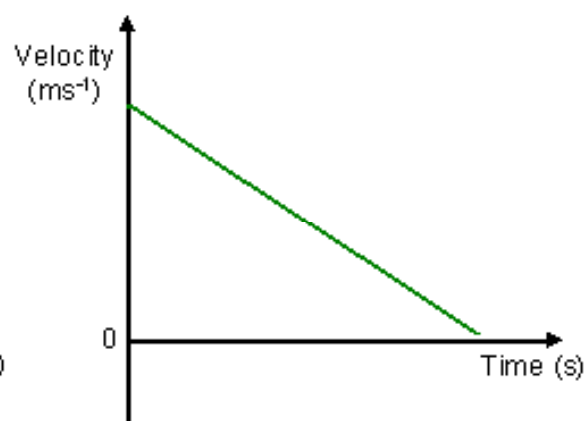
Graphs for a body with positive velocity and negative acceleration



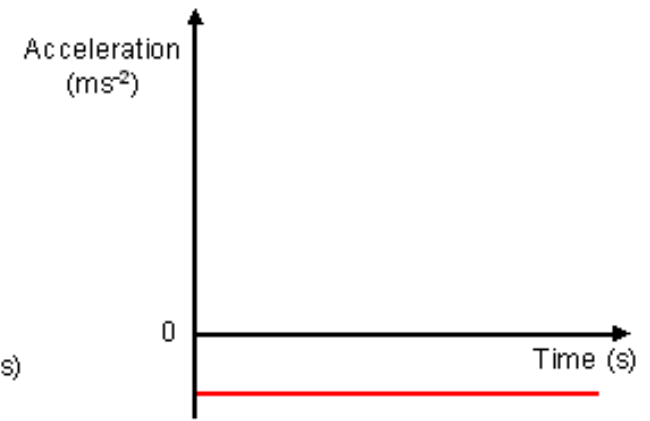
Position -Time Graph



Velocity -Time Graph



Acceleration -Time Graph



The slopes help us sketch the motion of other graphs!

NEW MODEL = AREA

$$\bar{v} = \frac{\Delta x}{\Delta t} \rightarrow \Delta x = \Delta t \bar{v} \quad \text{AREA} = \text{BASE} \times \text{HEIGHT}$$

$$\Delta t = \text{BASE}$$

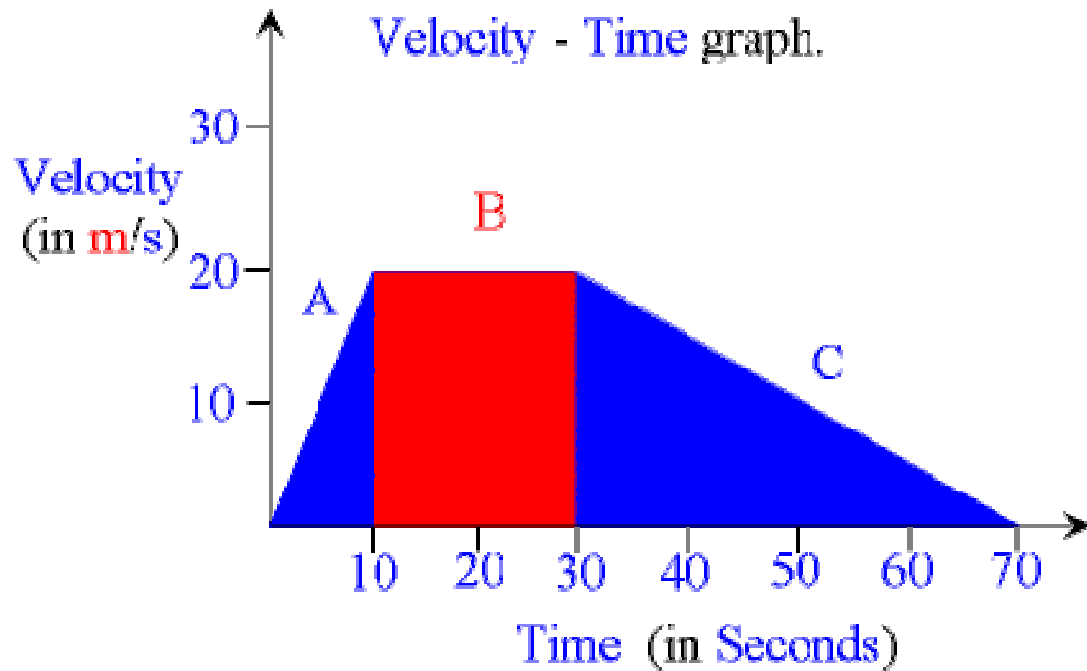
$$\bar{v} = \text{HEIGHT}$$

$$\Delta x = \text{AREA}$$

Looking at it from the point of view of units

$$\text{meters} = \text{seconds} \times \frac{\text{meters}}{\text{seconds}}$$

The Area Model



How **FAR** did this object travel during interval c?

$$A = \frac{1}{2}bh \quad A = \frac{1}{2}40 \cdot 20$$

$$\text{Area or } \Delta x = 400m$$

How **FAR** did this object travel during interval A?

$$A = \frac{1}{2}bh \quad A = \frac{1}{2}10 \cdot 20$$

$$\text{Area or } \Delta x = 100m$$

How **FAR** did this object travel during interval B?

$$A = b \cdot h \quad A = 20 \cdot 20$$

$$\text{Area or } \Delta x = 400m$$

The Area Model

$$a = \frac{\Delta v}{\Delta t} \rightarrow \Delta v = \Delta t a \quad \text{Area} = \text{Base} \times \text{Height}$$

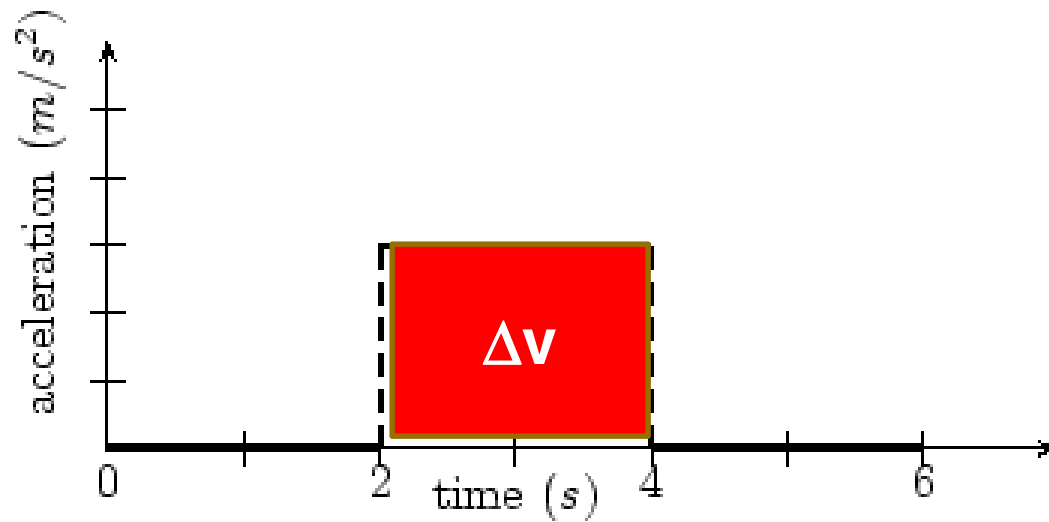
$$\Delta t = \text{Base}$$

$$a = \text{Height}$$

$$\Delta v = \text{Area}$$

$$\frac{\text{meters}}{\text{seconds}} = \text{seconds} \bullet \frac{\text{meters}}{\text{seconds}^2}$$

The Area Model



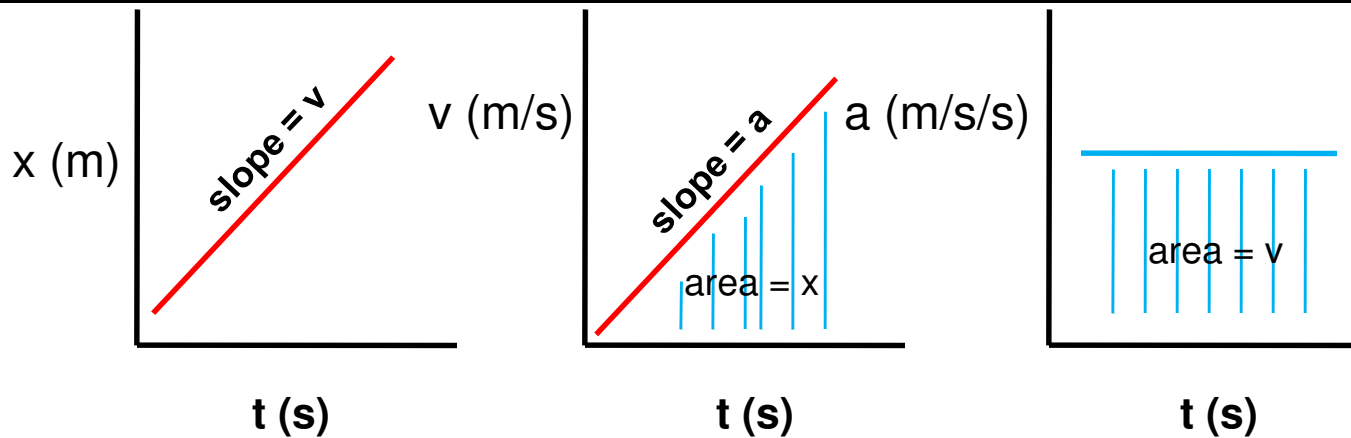
What is the change in Velocity during the t=2 to t=4 interval?

$$A = b \cdot h \quad A = 2 \cdot 3$$

$$A = \Delta v = 6 \text{ m/s}$$

In summary

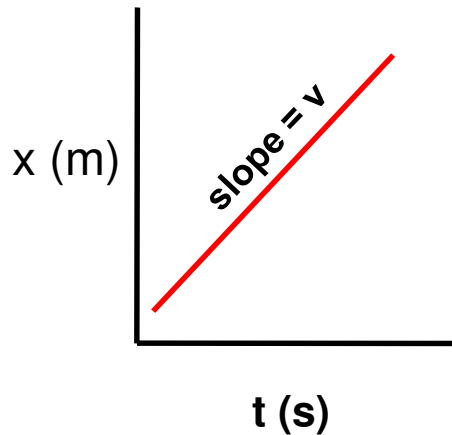
Graph	Slope	Area
x vs. t	Velocity	N/A
v vs. t	Acceleration	Displacement
a vs. t	N/A	Velocity



Slope	Graph	Area
↓	x vs. t	↑
	v vs. t	
↓	a vs. t	↑

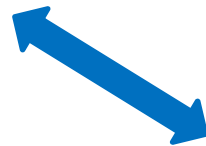
Comparing and Sketching graphs

One of the more difficult applications of graphs in physics is when given a certain type of graph and asked to draw a different type of graph

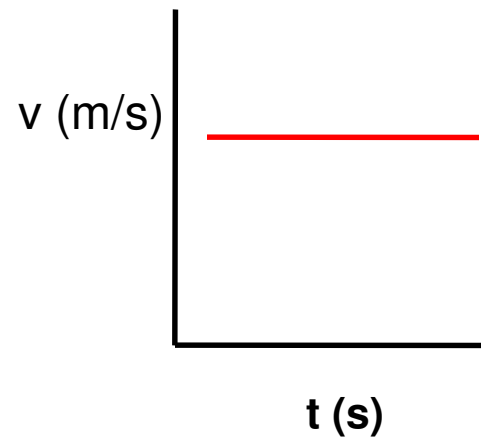


List 2 adjectives to describe the SLOPE or VELOCITY

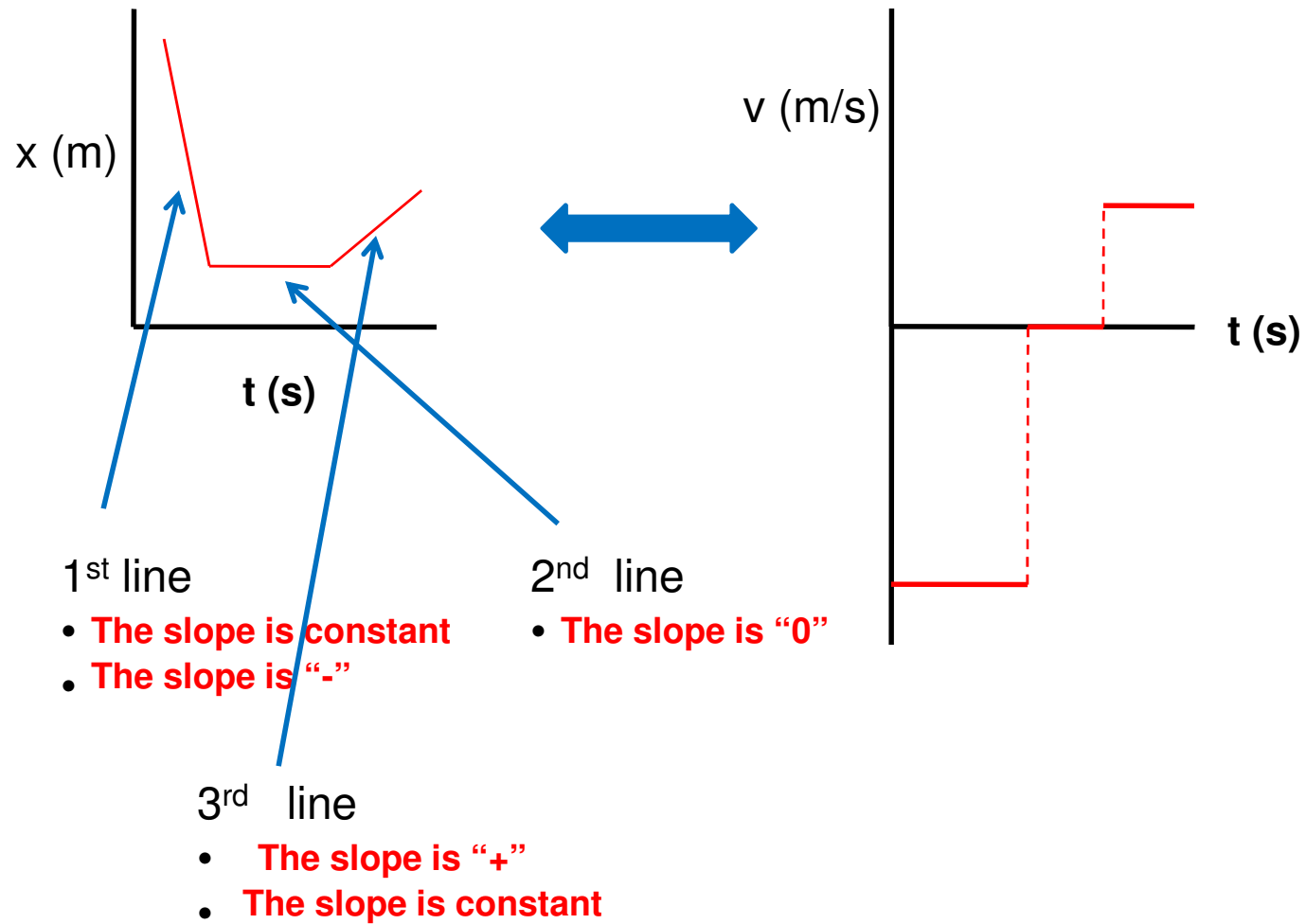
1. The slope is **CONSTANT**
2. The slope is **POSITIVE**



How could you translate what the SLOPE is doing on the graph ABOVE to the Y axis on the graph to the right?



Example



Example – Graph Matching

What is the SLOPE(a) doing?

The slope is increasing

