January 28, Week 3

Today: Chapter 2, Constant Accleration

Homework Assignment #3 - Due February 1

Mastering Physics: 6 problems from chapter 2.

Written Question: 2.88

Box numbers can be found on webpage

Wednesday office hours will be 2:30-5:00

For now on, Mastering Physics will take off points for missed homework questions.

Review

Three physical quantities of kinematics:

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Position, x - Where an object is located = how far and what direction from origin

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Three physical quantities of kinematics:

Position, x - Where an object is located = how far and what direction from origin

Velocity, v - How fast an object is going and direction motion = speed and from its current position what direction is it going towards. Also, slope of the position-versus-time graph.

Acceleration, a - The rate at which velocity is changing. Has same sign as velocity for speeding up. Opposite sign for slowing down. Slope of the velocity-versus-time graph.

Acceleration Exercise

For the following motion diagram and coordinate system, which of the following are correct signs for its kinematical quantities?

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	x	v_x	a_x
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(b)	$-$	$+$	$-$
(c)	$-$	$-$	$+$

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Constant Acceleration

For a constant acceleration:

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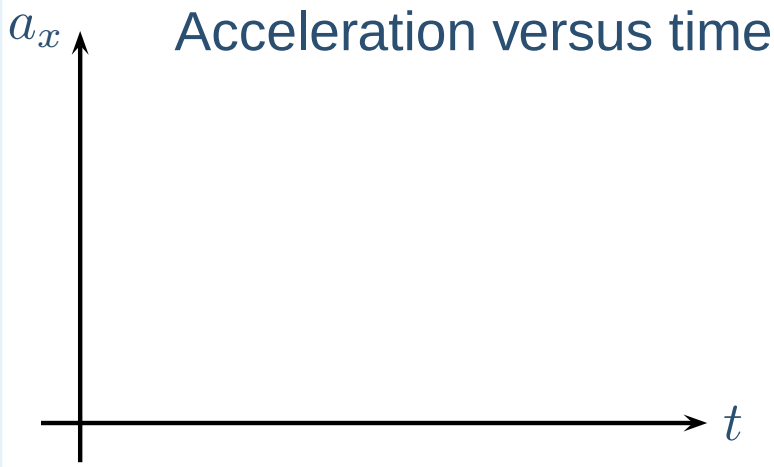

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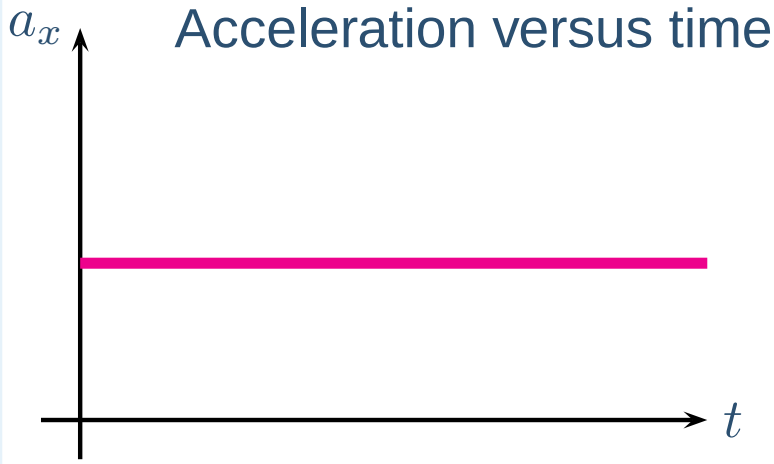
For a constant acceleration:

Acceleration versus time



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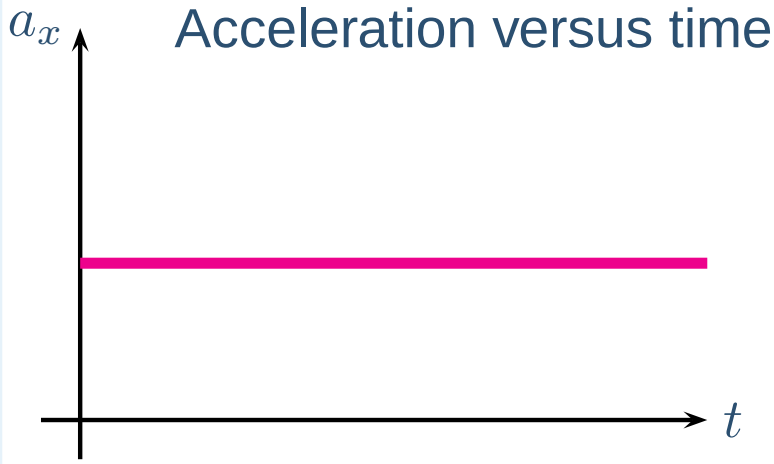

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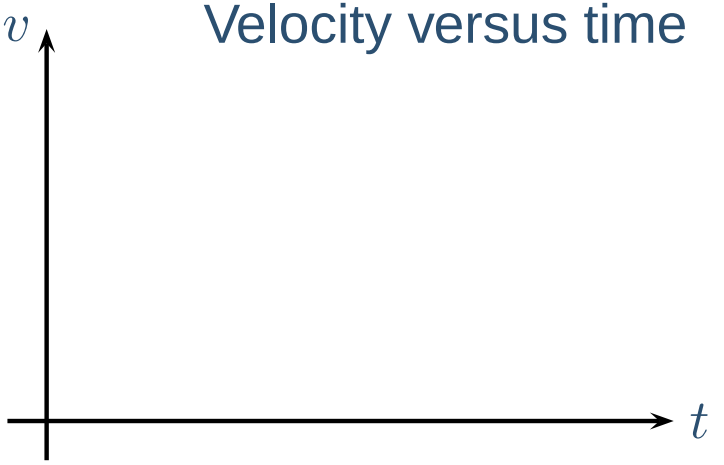

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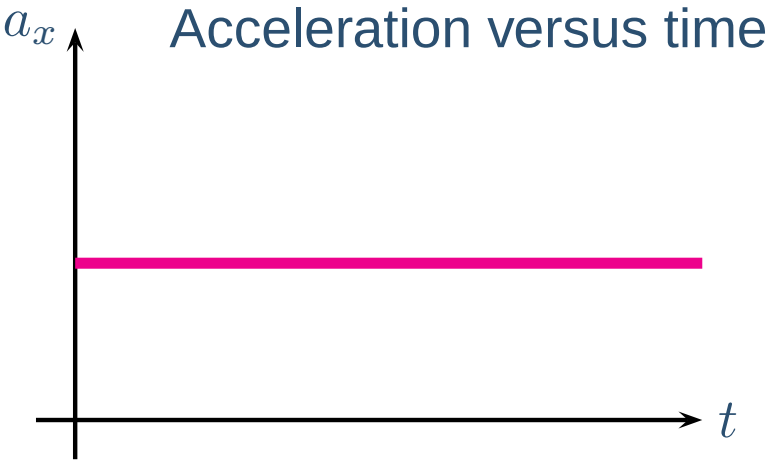

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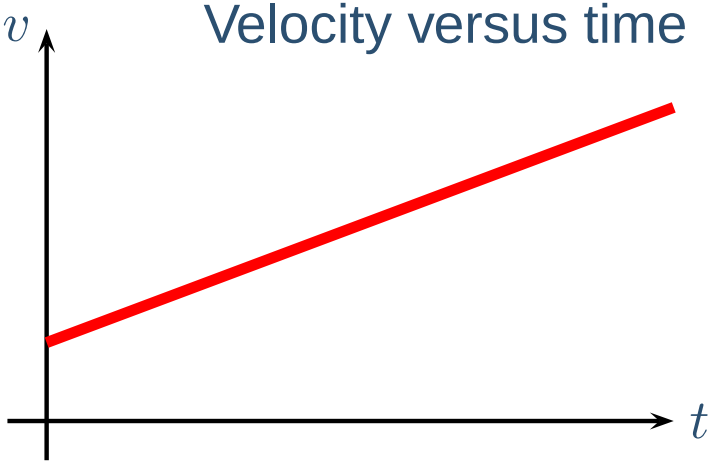

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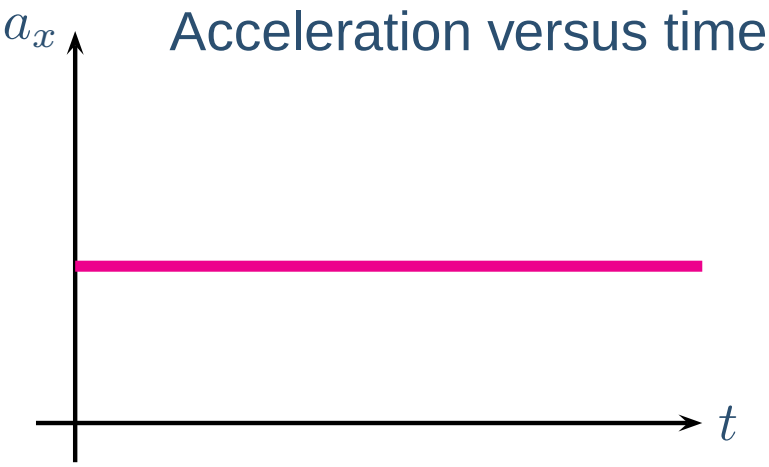

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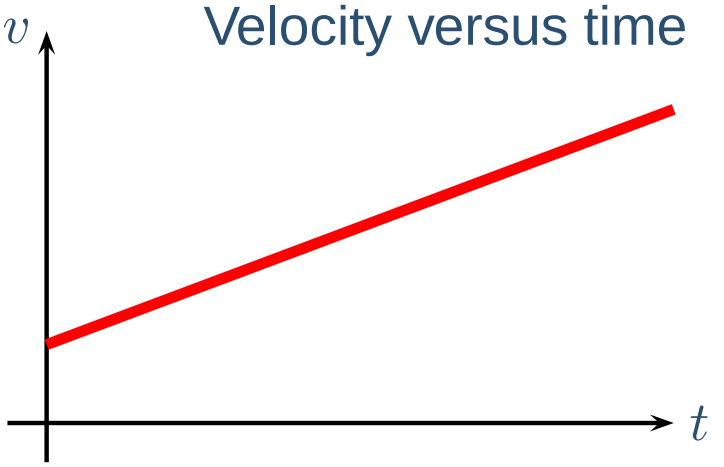
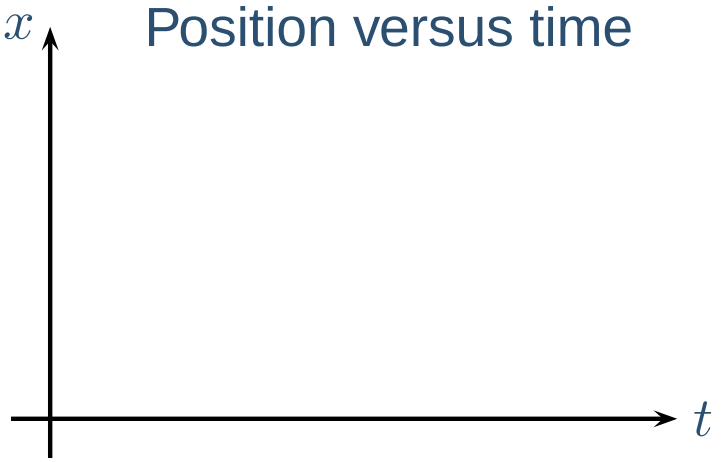


Position versus time



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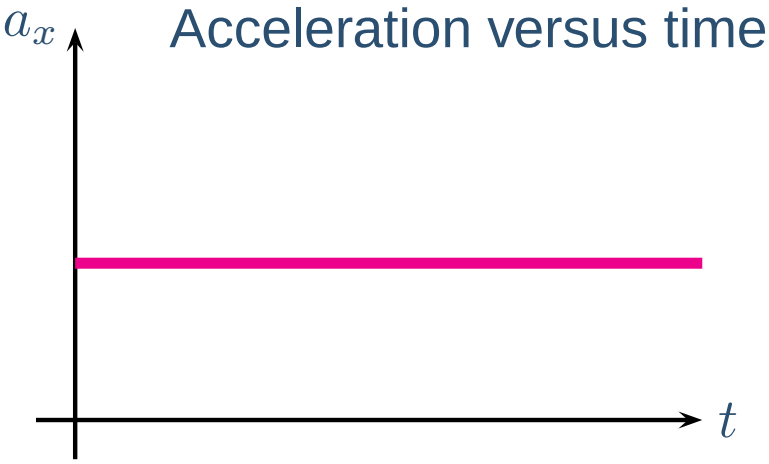

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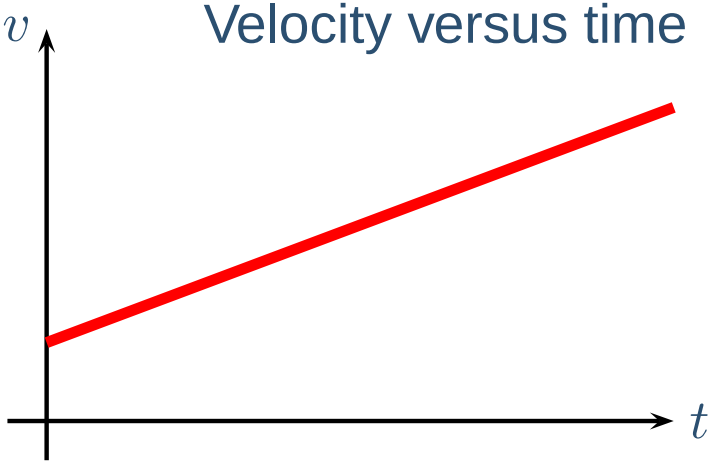

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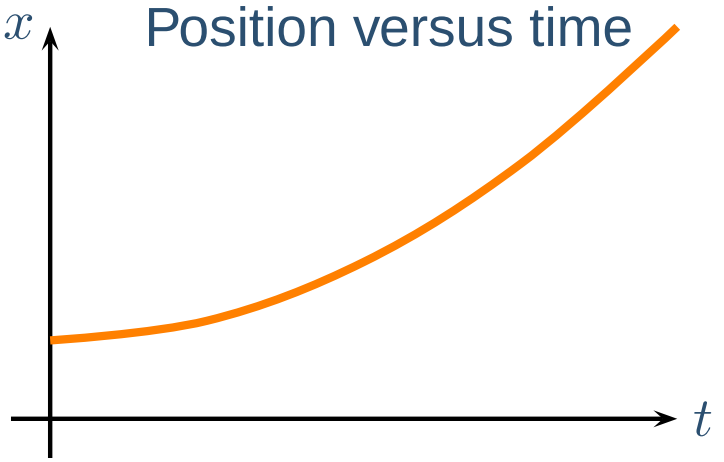

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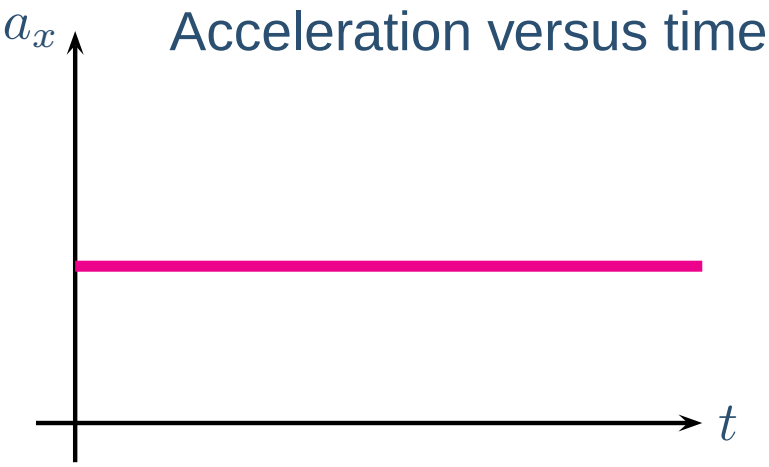

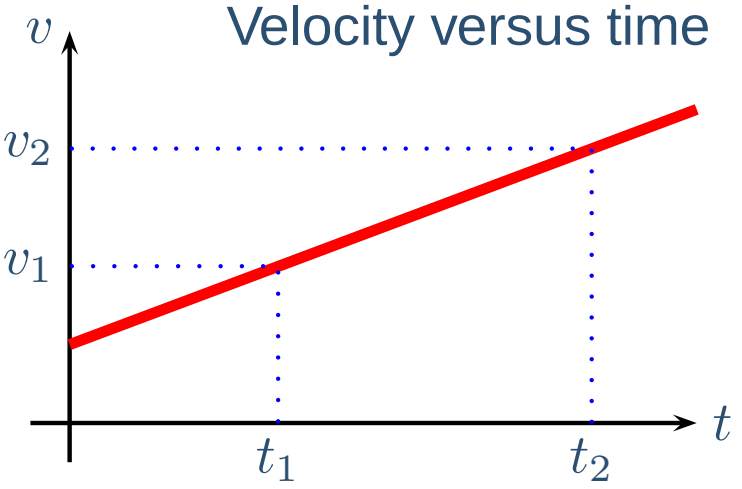

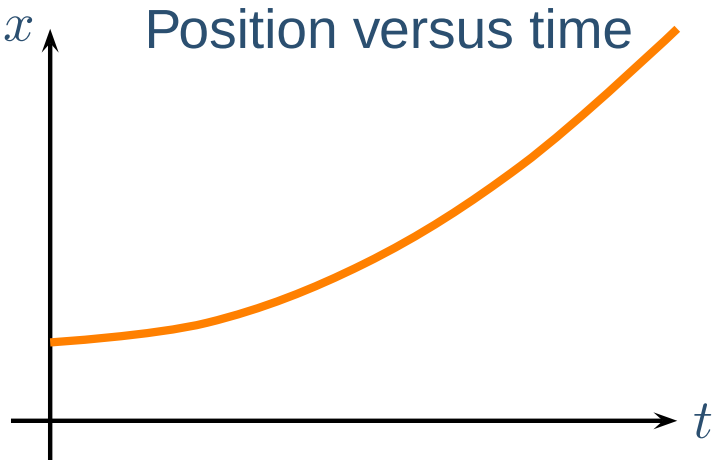

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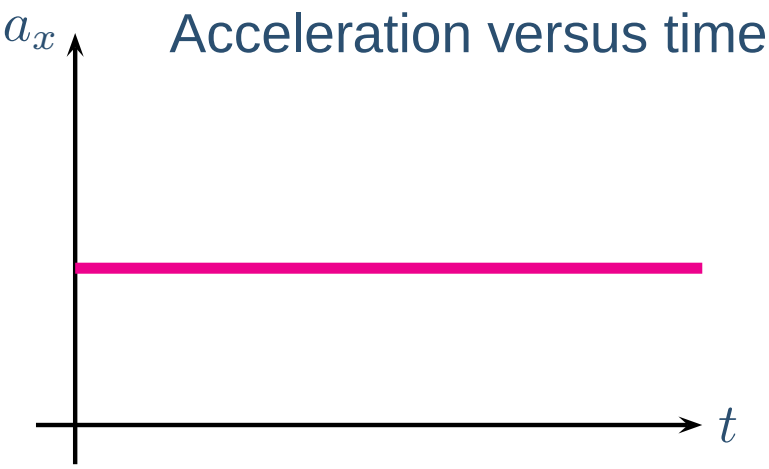

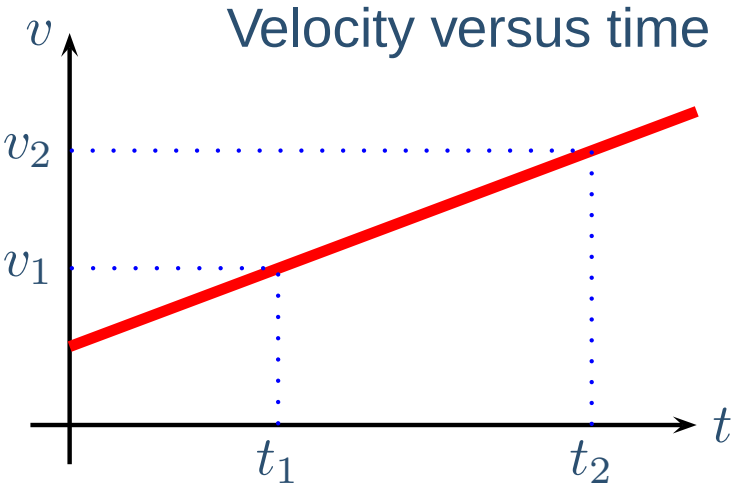

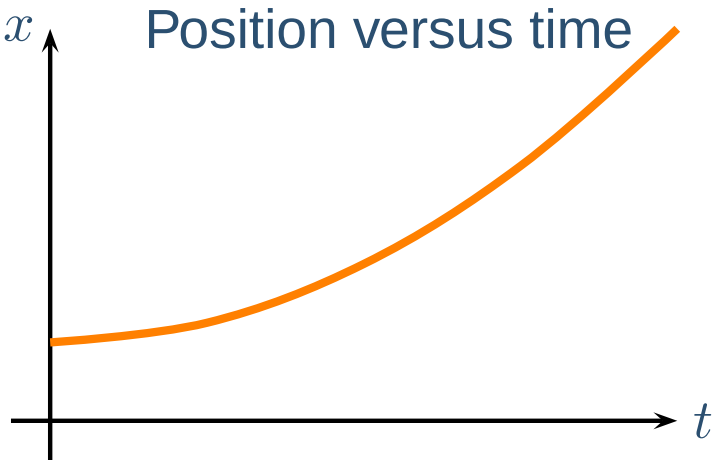

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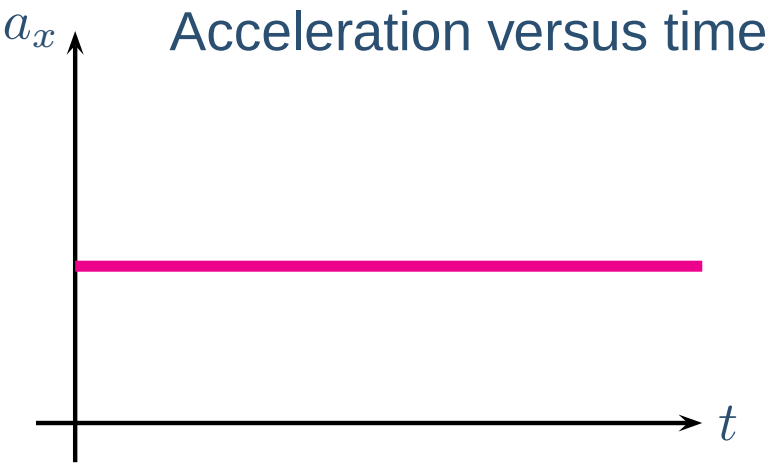

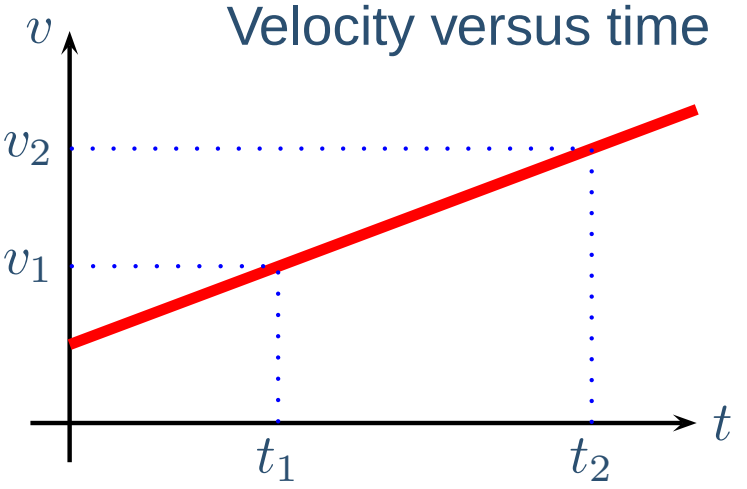

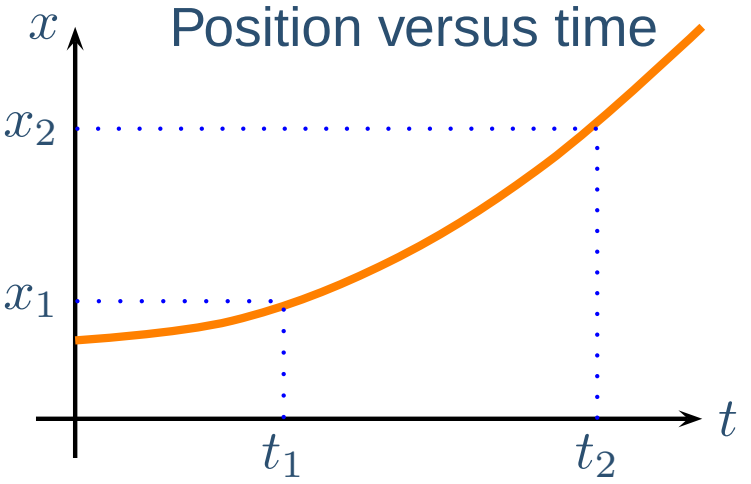

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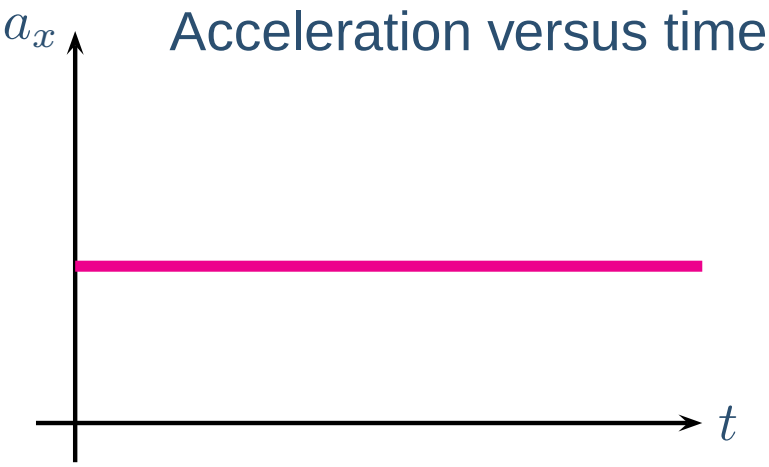

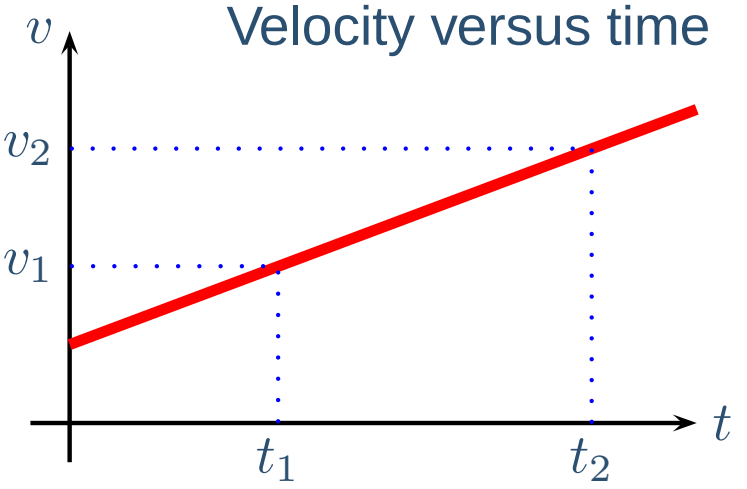

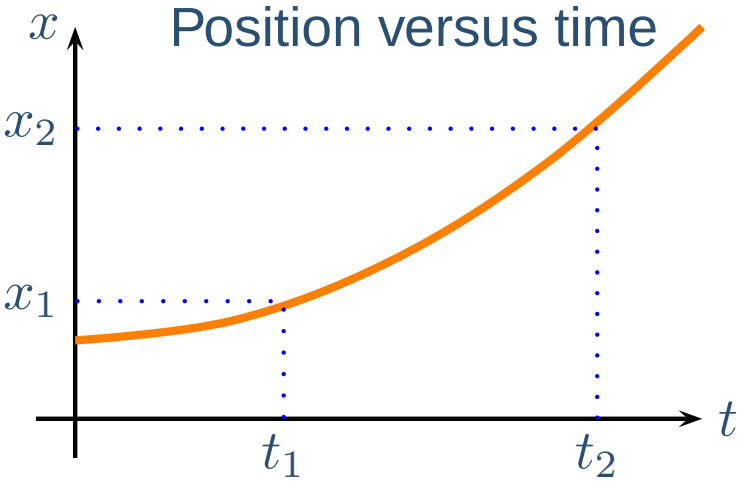

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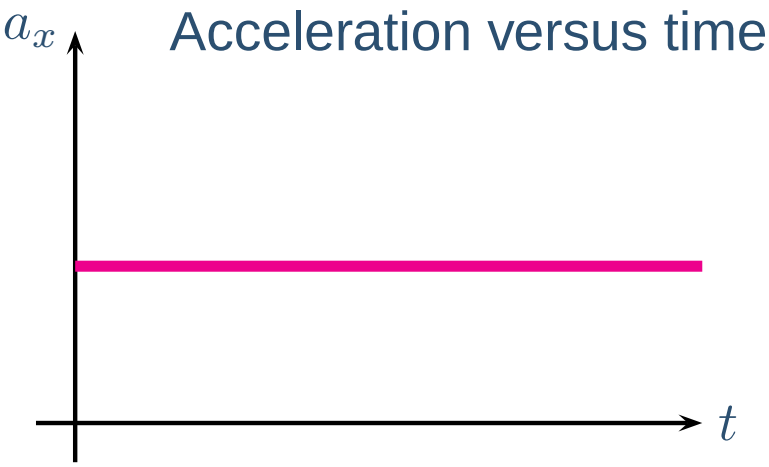

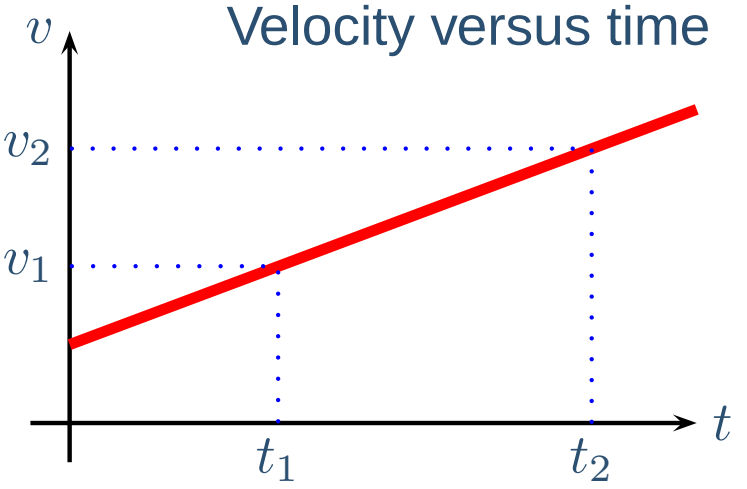

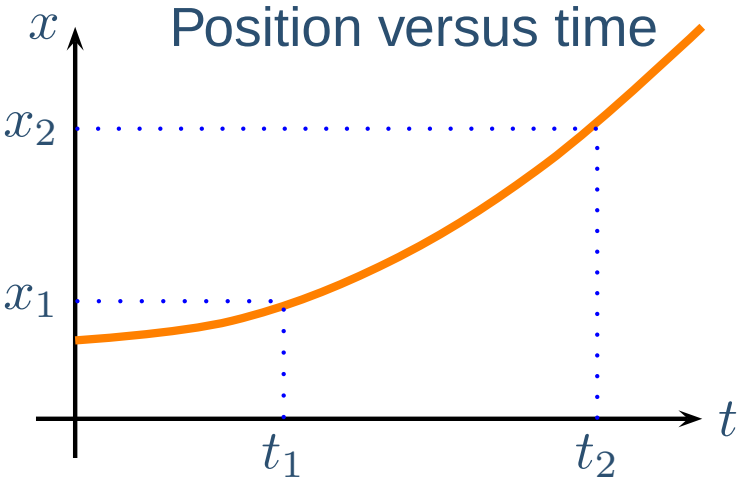

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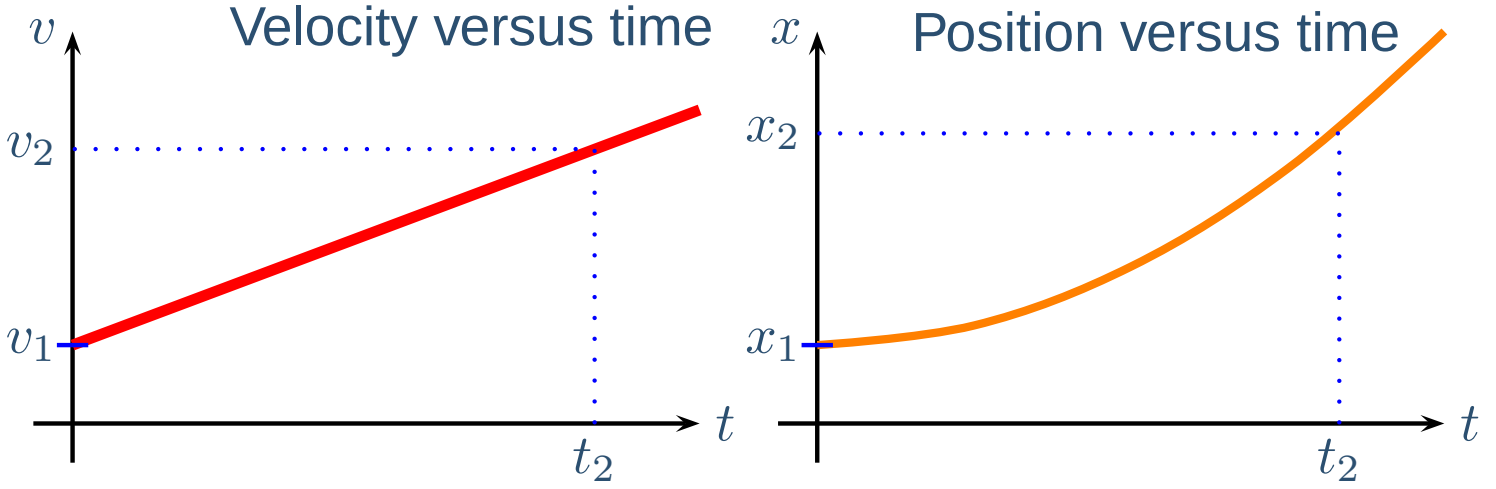

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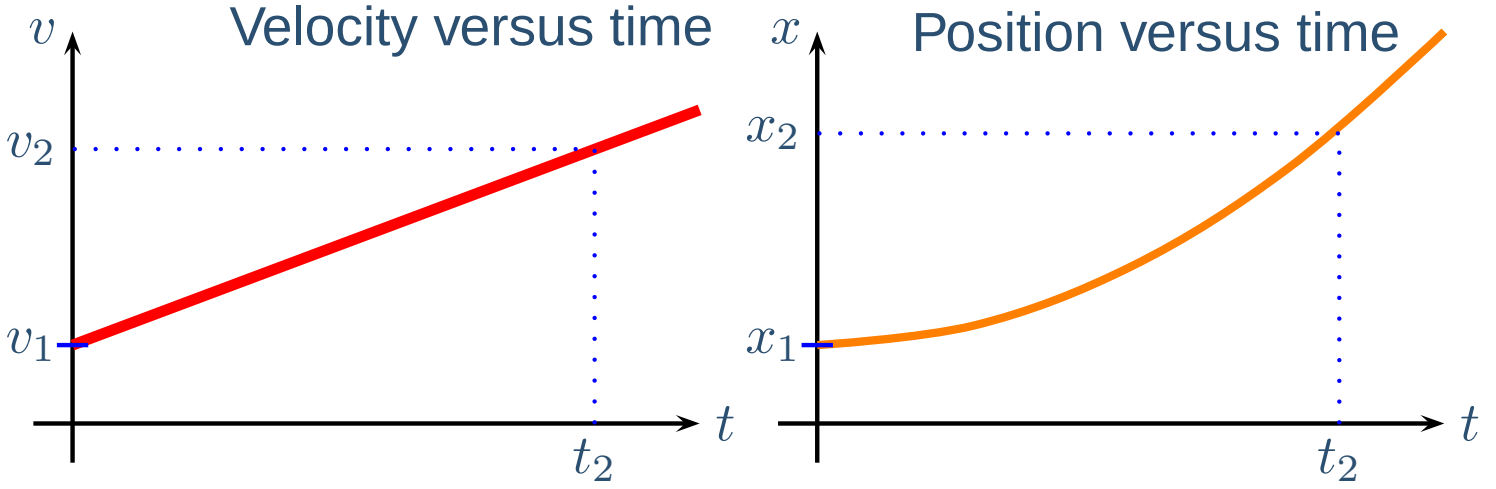

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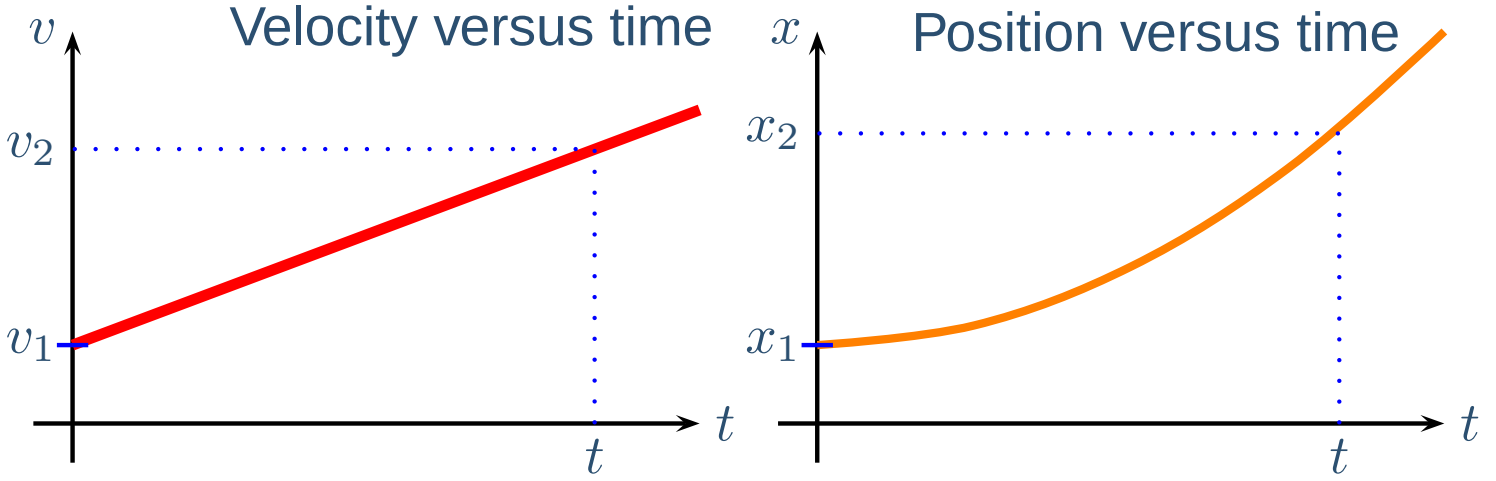

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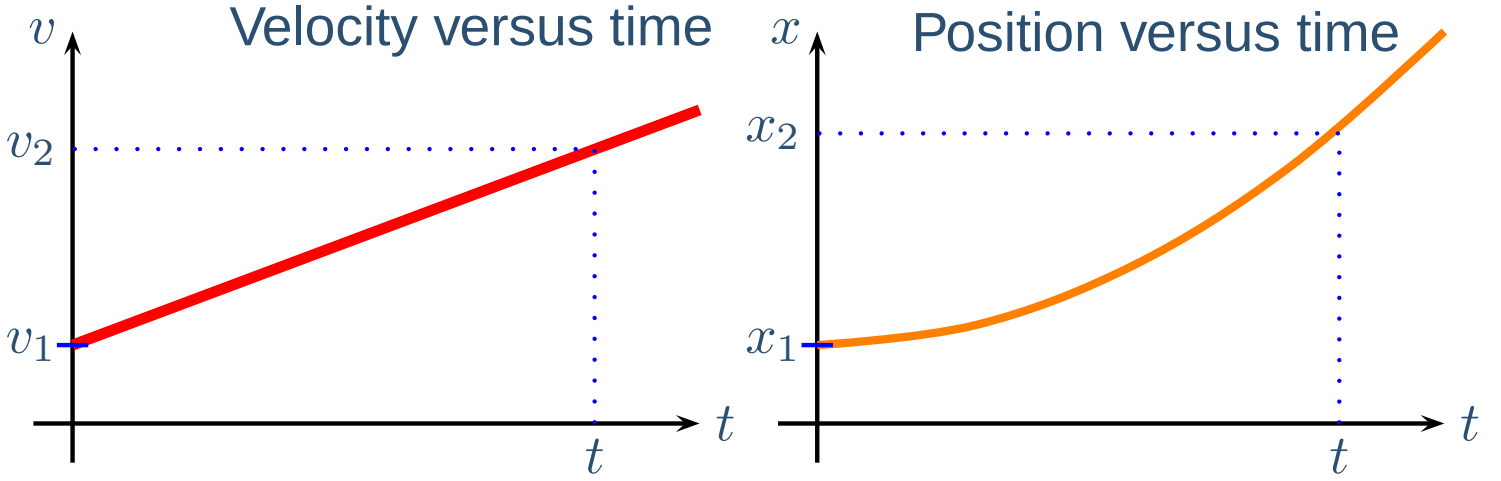

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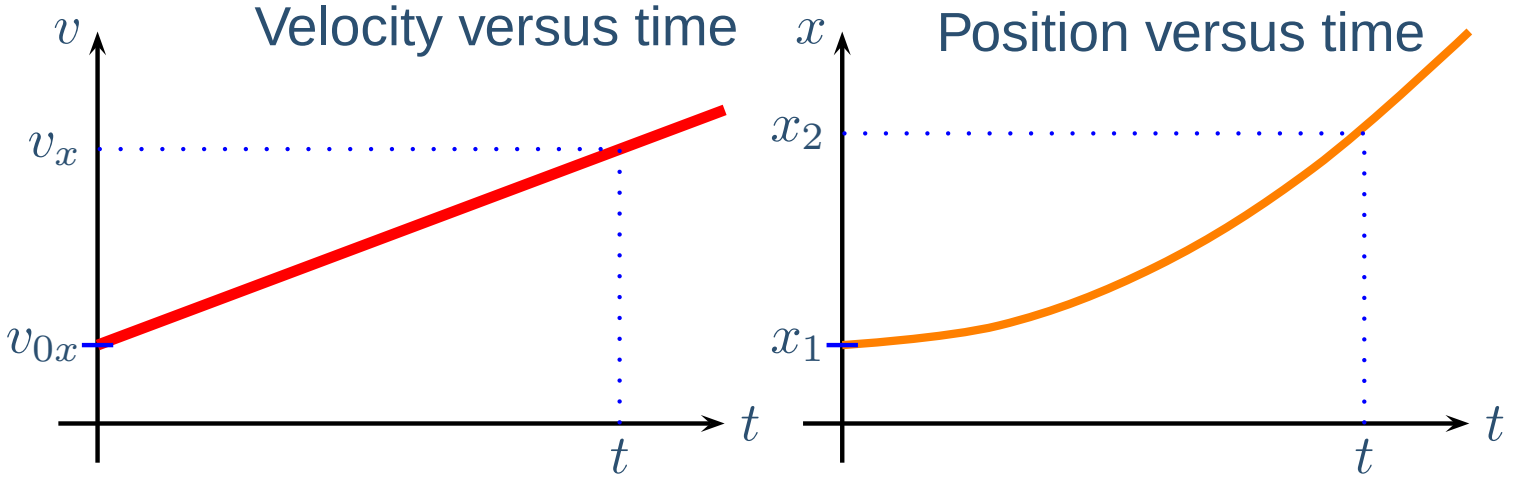

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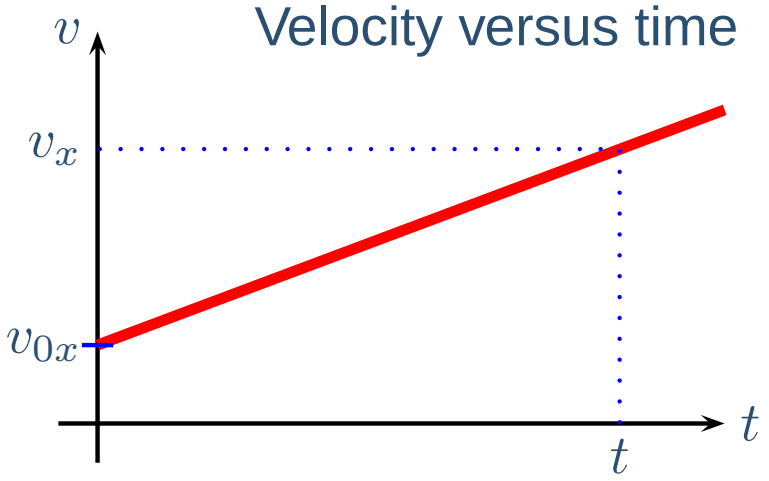

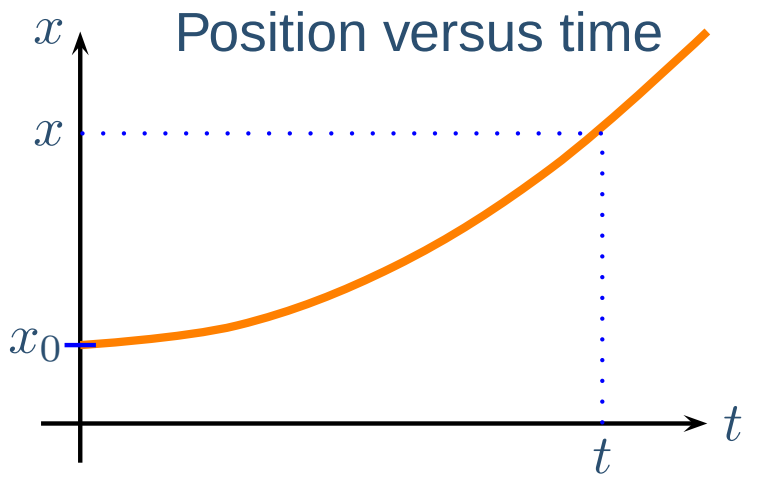

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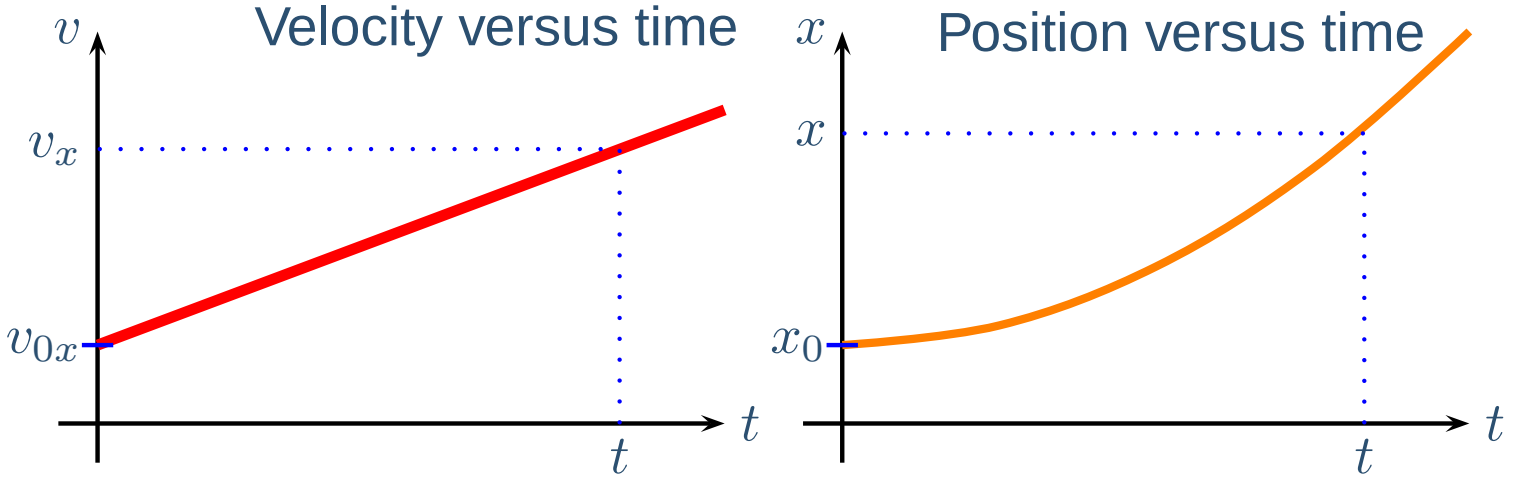

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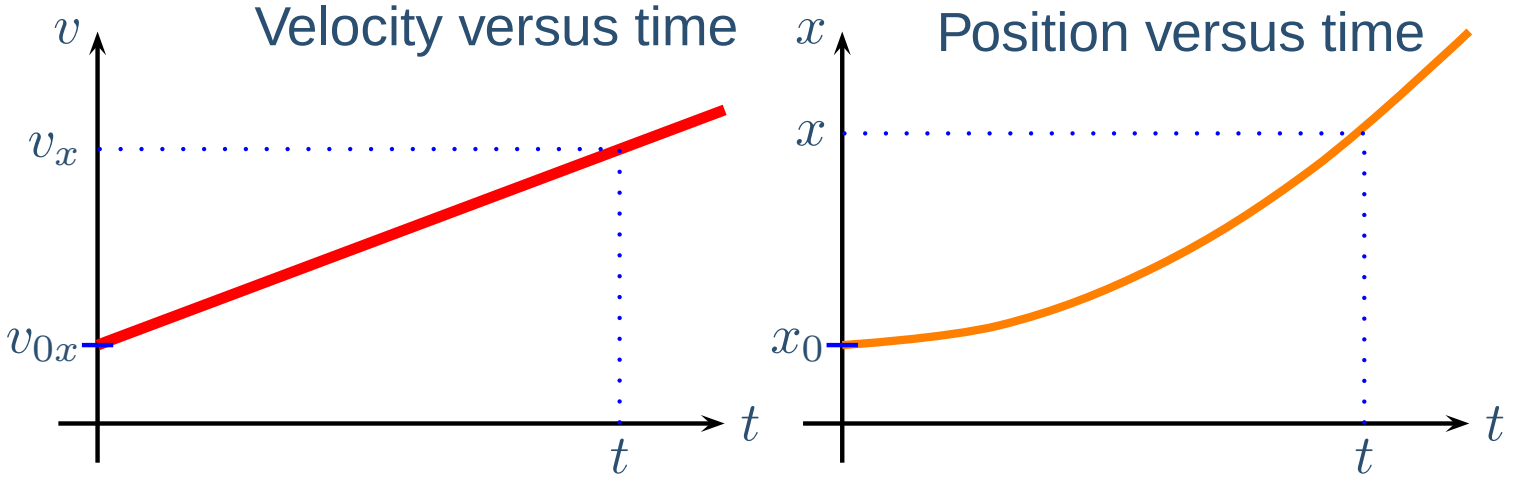

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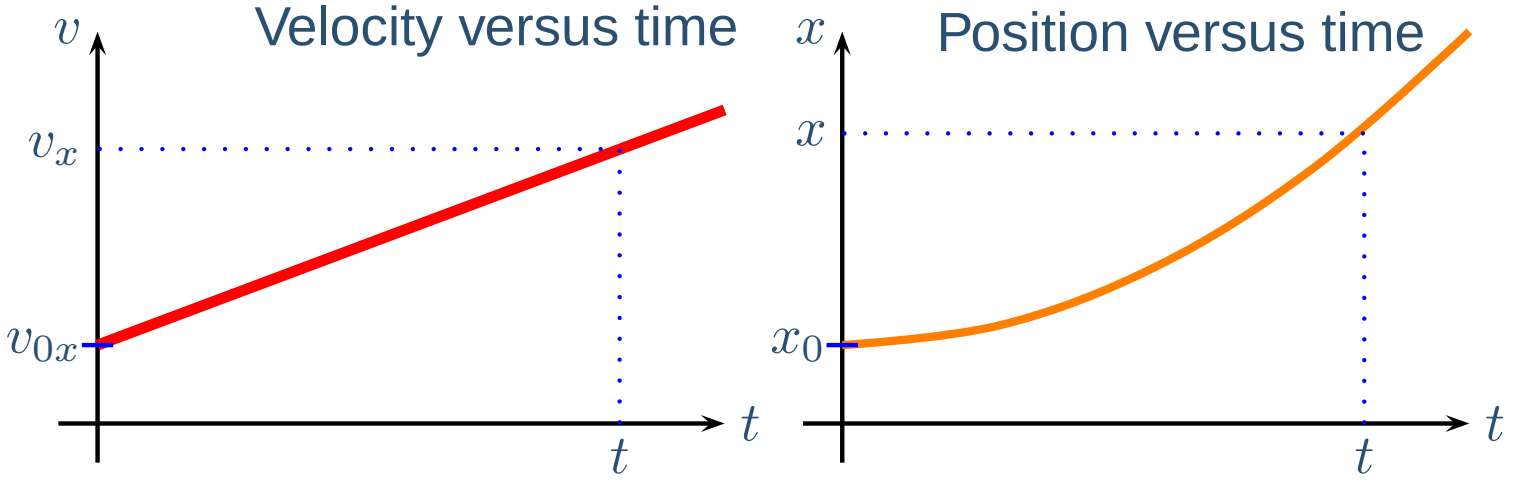

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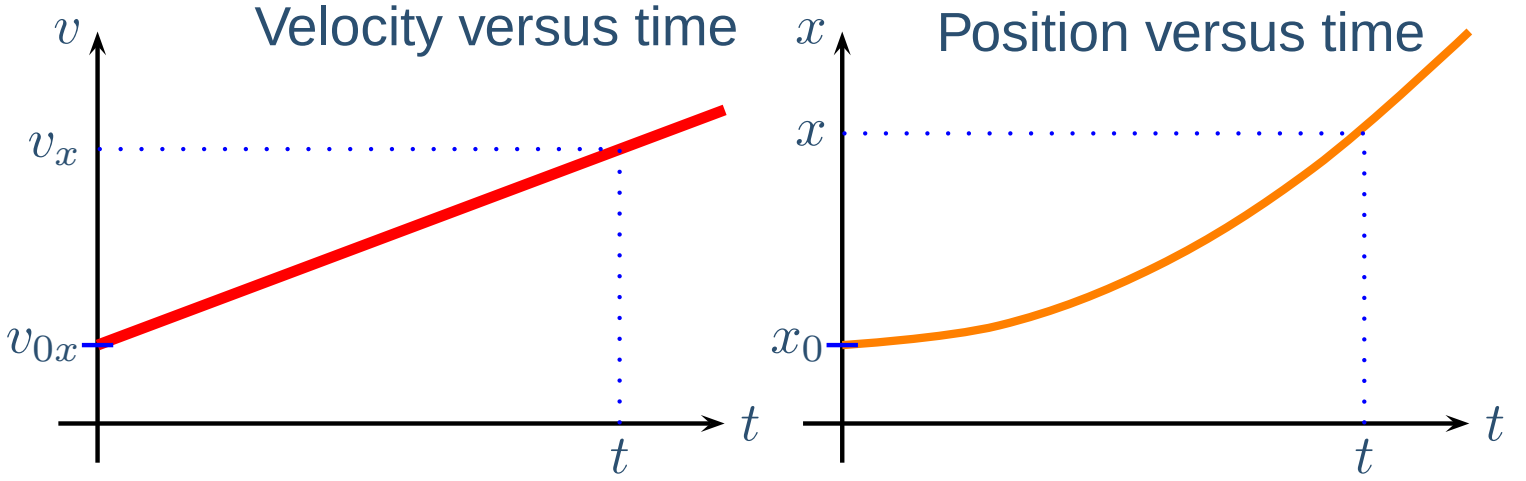

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Example: A car is traveling on a straight road with a speed of $30.0\,m/s$ when the driver hits the brakes causing a constant deceleration of $2.5\,m/s^2$. How long does it take and how far does the car go while stopping?

Problem Solving Exercise

A bicyclist is stopped at a red light. When the light turns green, he accelerates at $0.67\,m/s^2$. To find how long it takes him to cross the 3.2-m-long intersection, we would use which equation of motion?

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Problem Solving Exercise

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(a) $x = x_0 + (v_{0x})t + \frac{1}{2}a_x t^2$

(b) $v_x = v_{0x} + a_x t$

(c) $v_x^2 = v_{0x}^2 + 2a_x\,(x - x_0)$

(d) $v = \frac{\Delta x}{\Delta t}$

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(a) $x = x_0 + (v_{0x})t + \frac{1}{2}a_x t^2$

$x_0 = 0, \quad x = 3.2\,m$

$v_{0x} = 0, \quad a_x = 0.67\,m/s^2$

(b) $v_x = v_{0x} + a_x t$

(c) $v_x^2 = v_{0x}^2 + 2a_x\,(x - x_0)$

(d) $v = \dfrac{\Delta x}{\Delta t}$

(e) None of these.