September 12, Week 4

Physics 151

Today: Chapter 3: 2D Motion

Homework Assignment #4 - Due September 14.

Mastering Physics: 7 problems from chapter 3.

Written Questions: 3.4, 3.69

The motion diagram for problem 3.4 can be found in the homework file on the webpage for convenient printing.

Thursday office hours, 2:00-6:00.

Exam #1 - Monday, September 17.

Practice Exam Available on Website.

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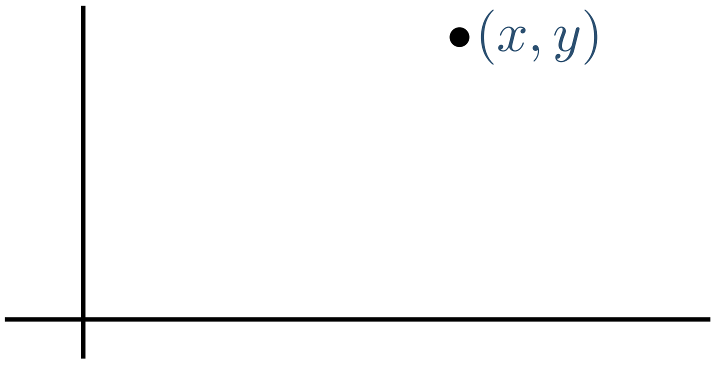

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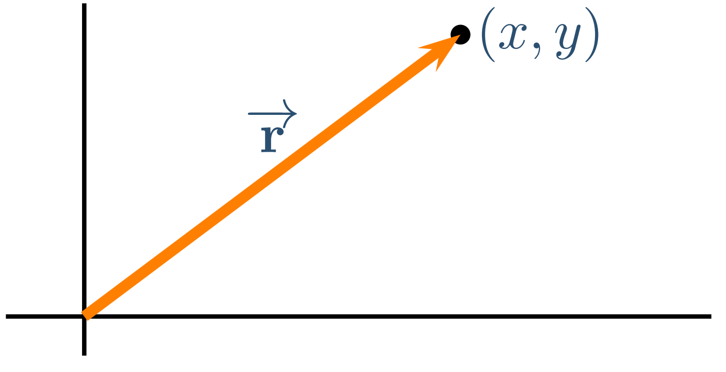

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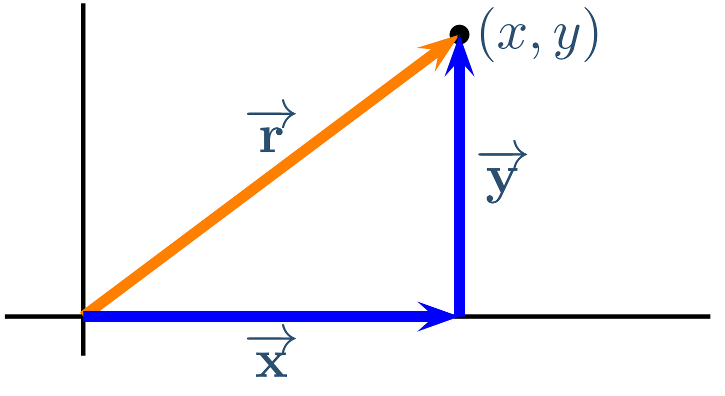

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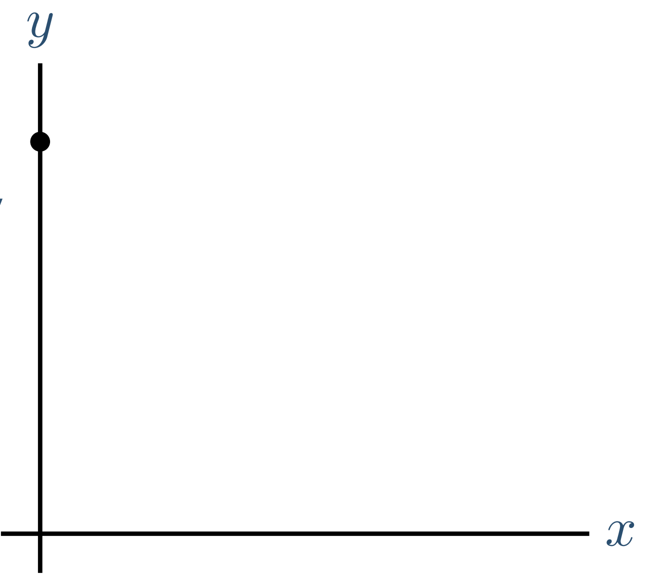

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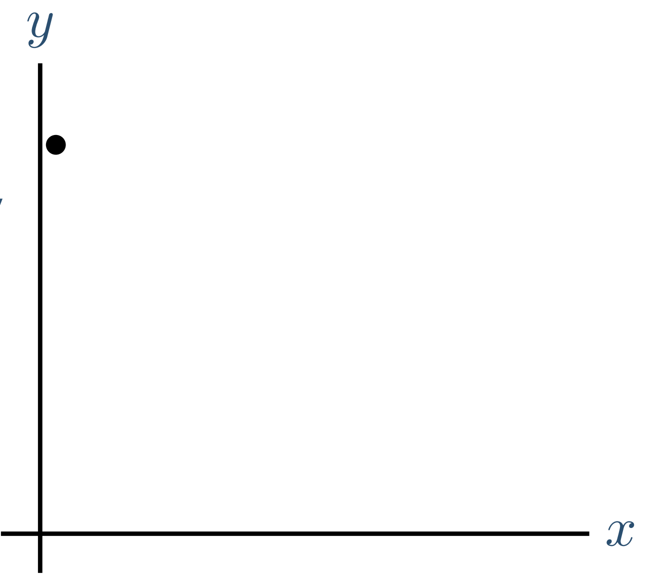

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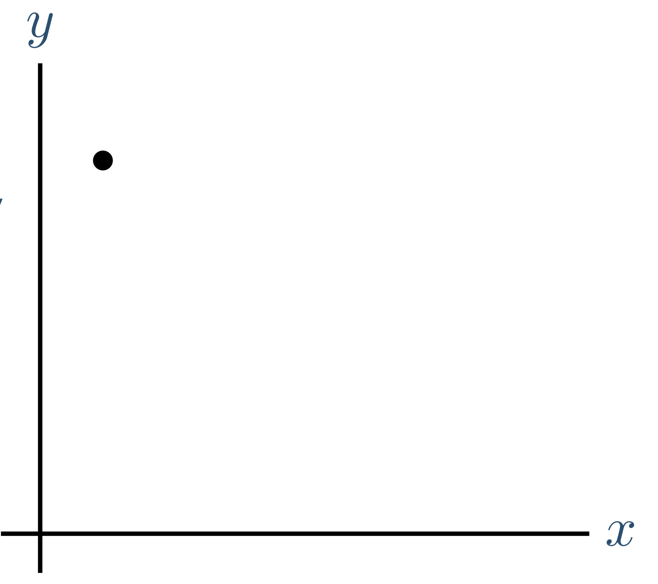

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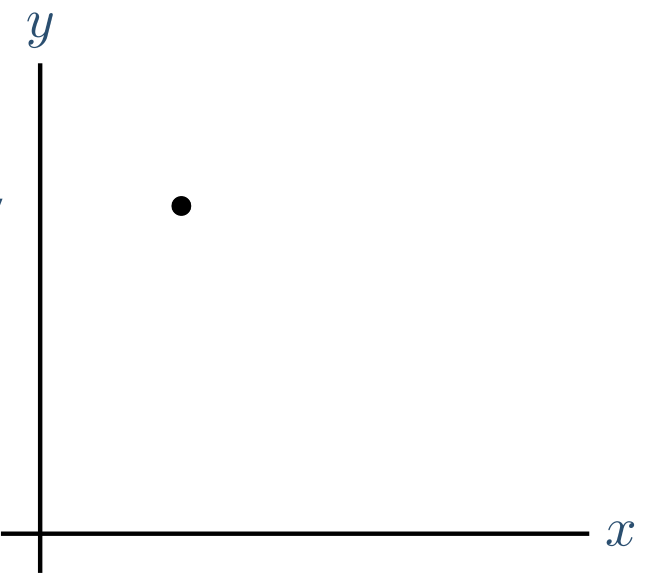

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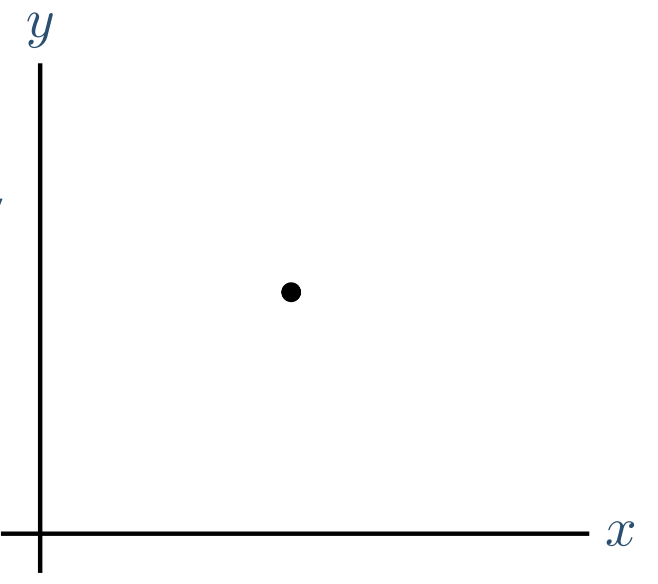

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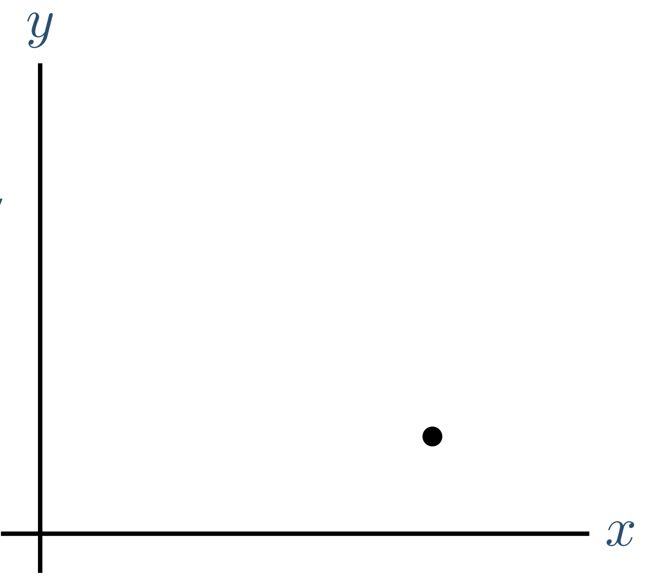

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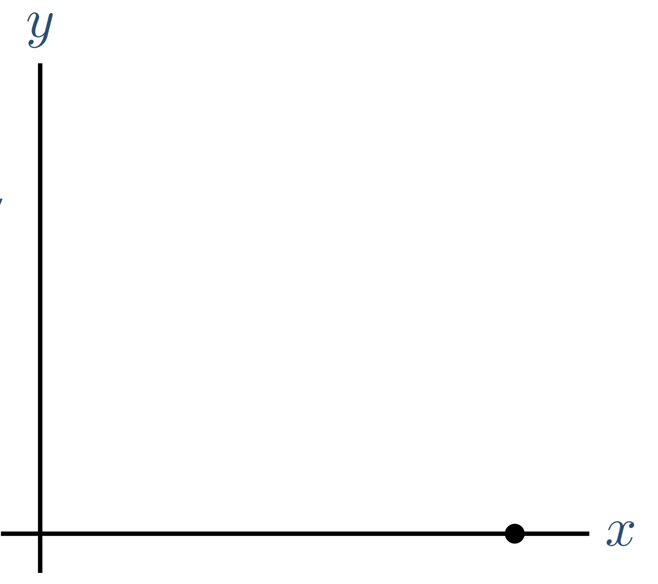

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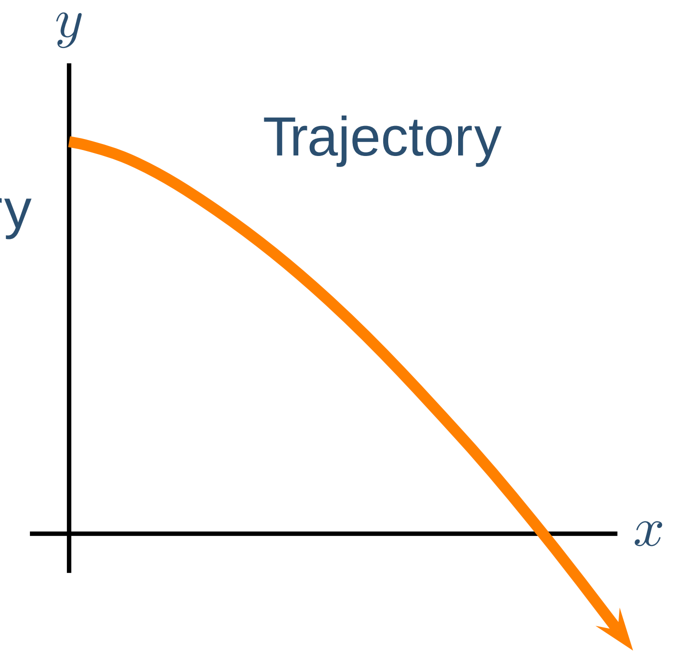

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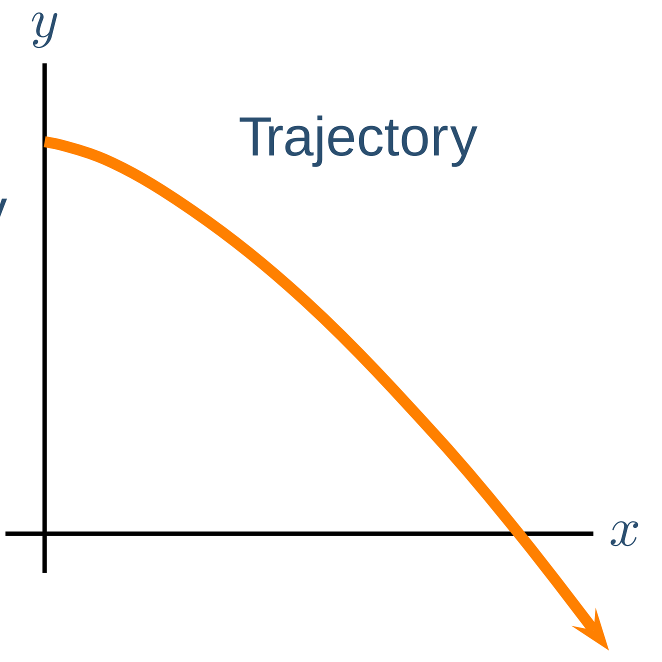

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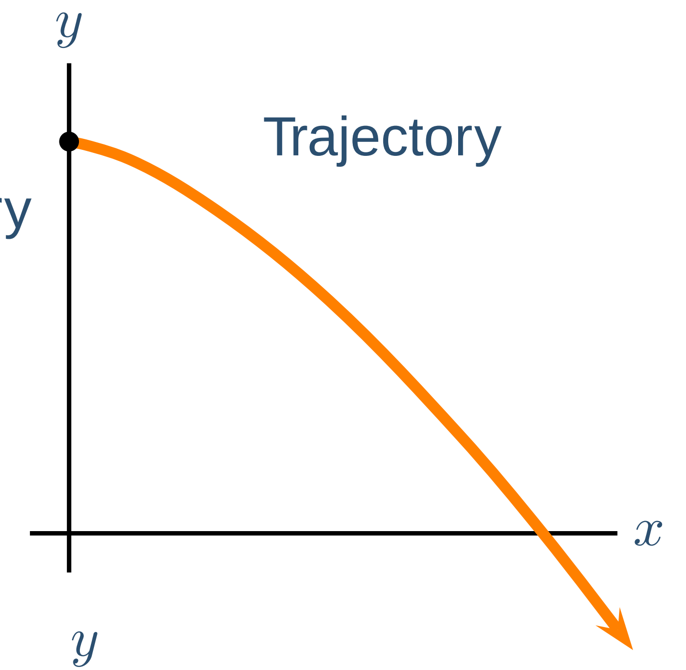

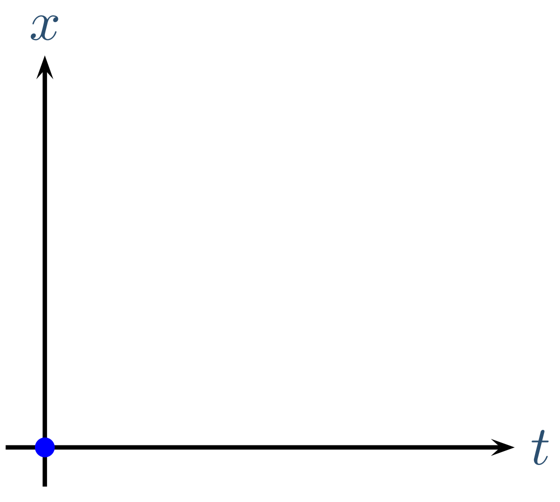

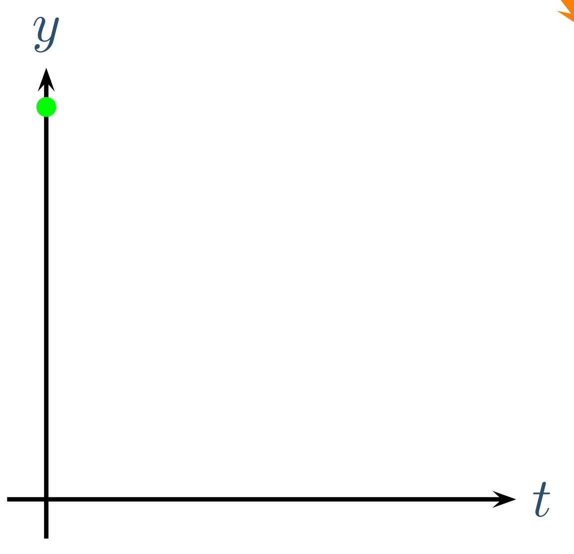

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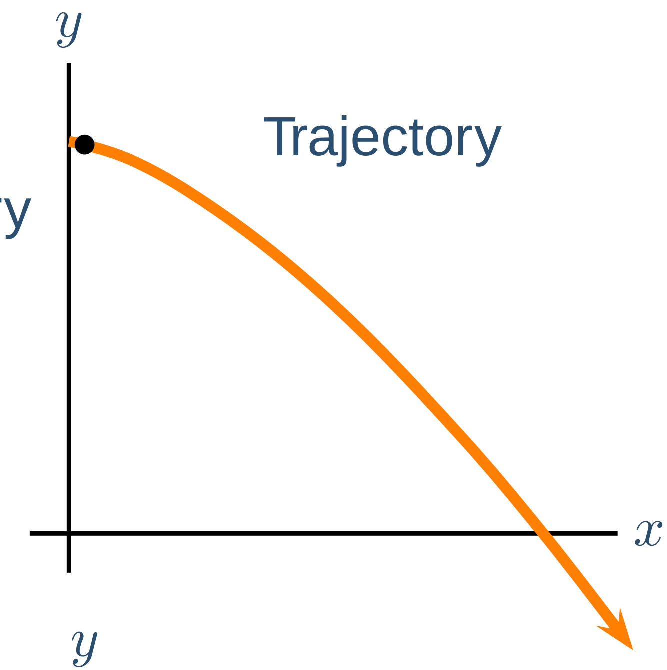

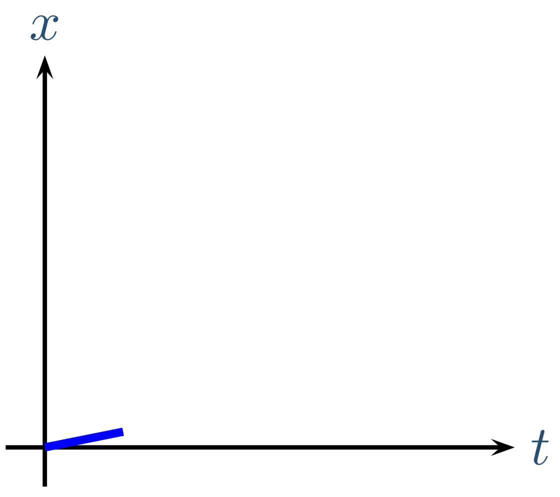

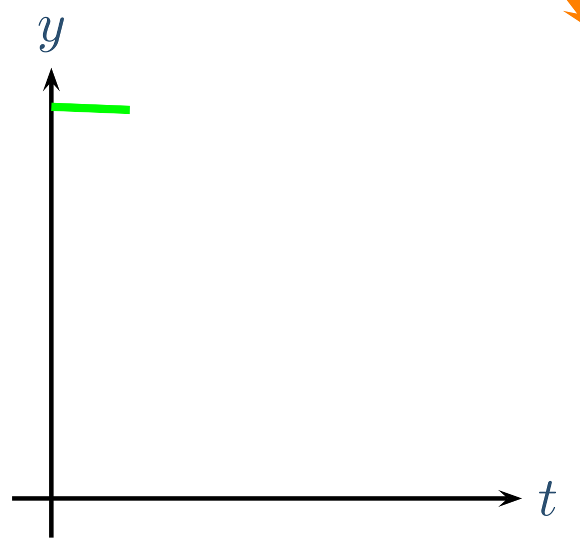

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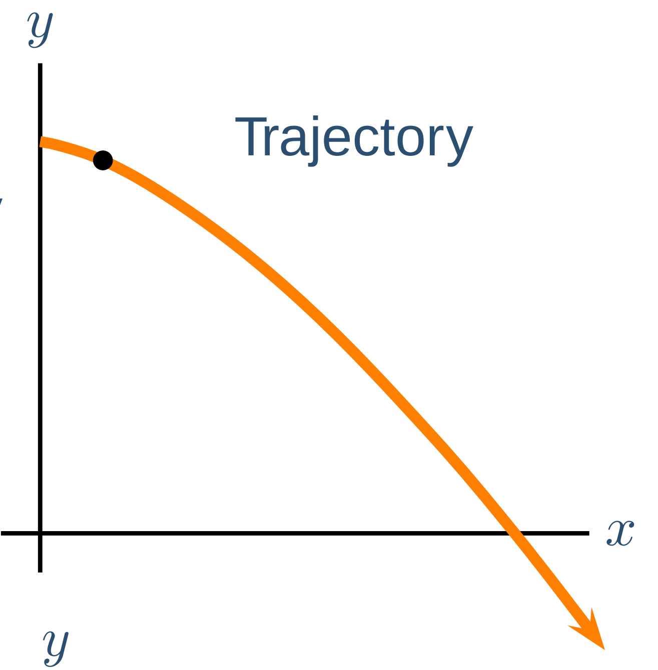

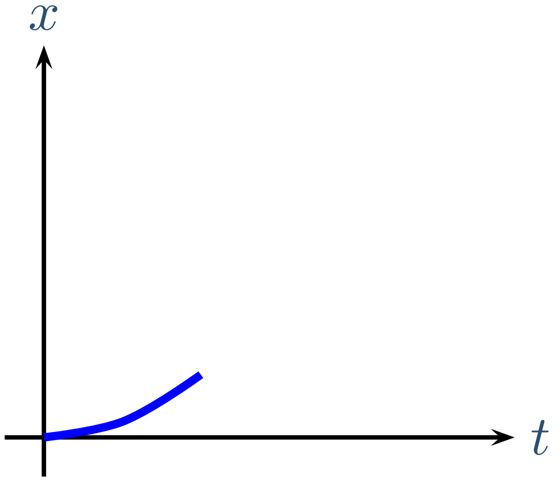

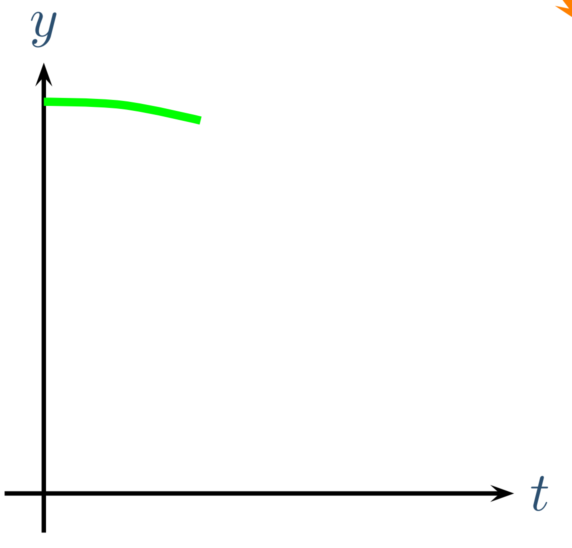

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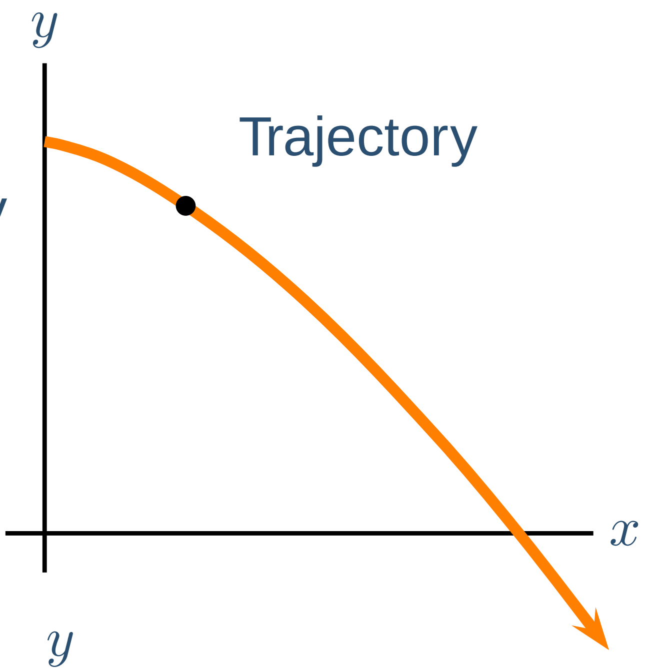

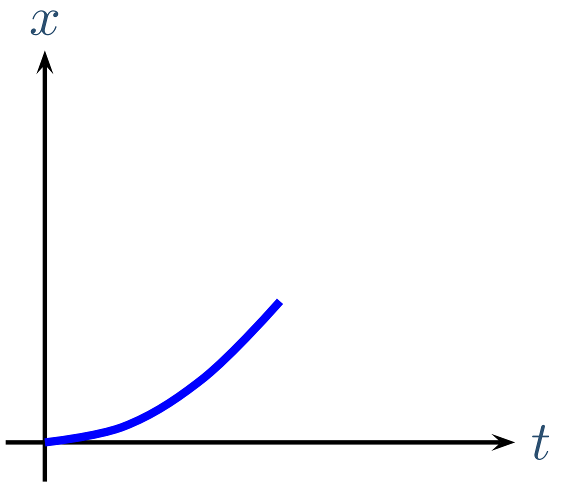

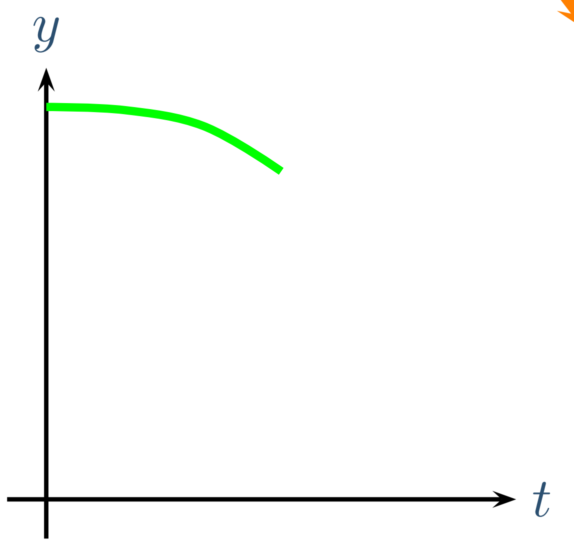

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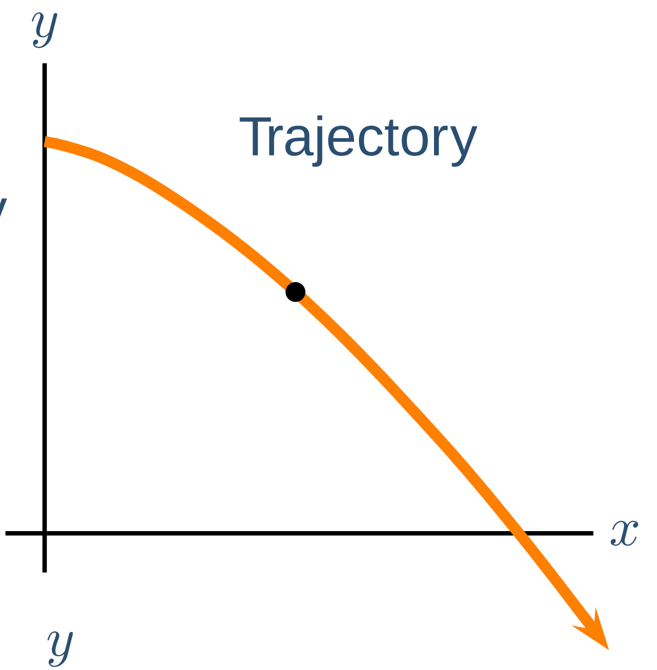

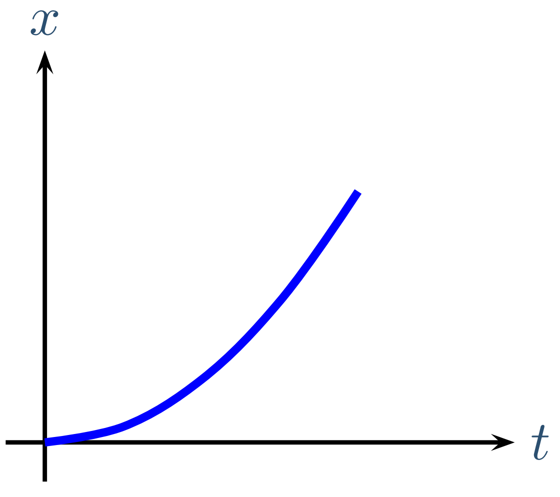

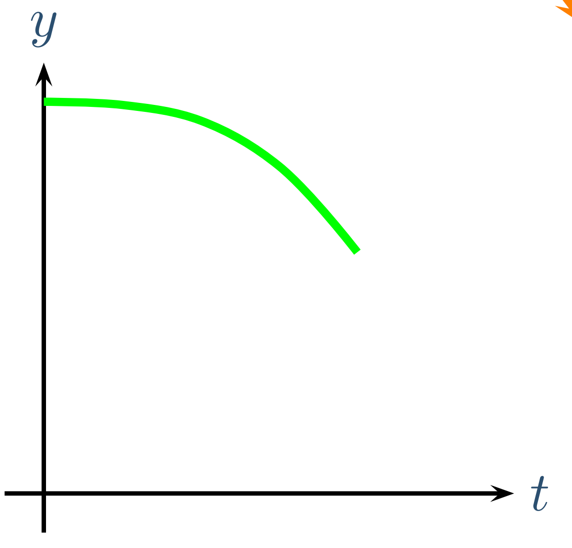

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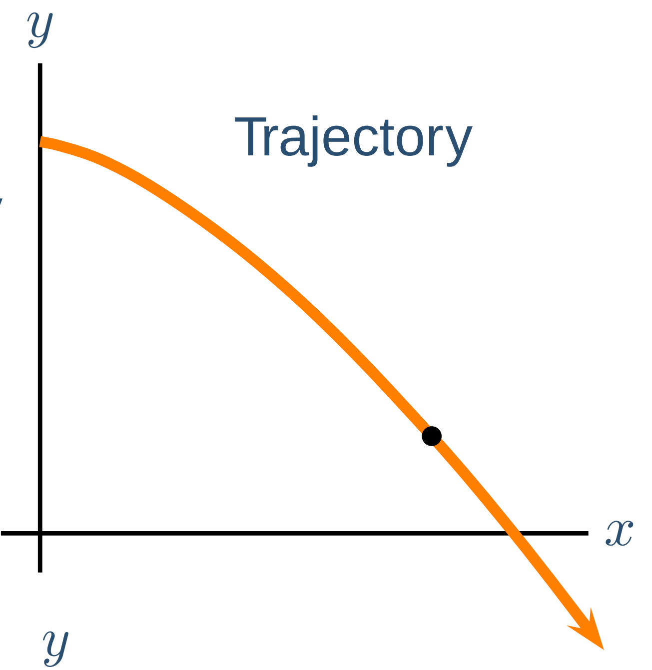

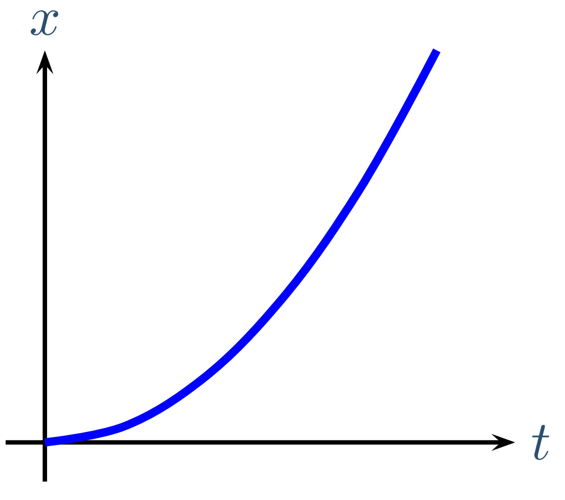

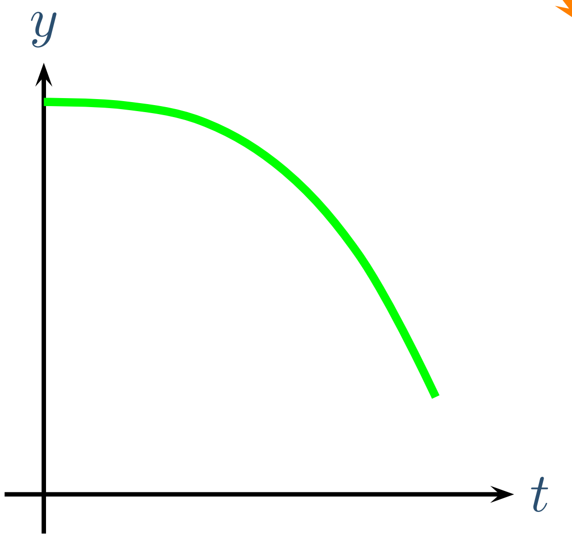

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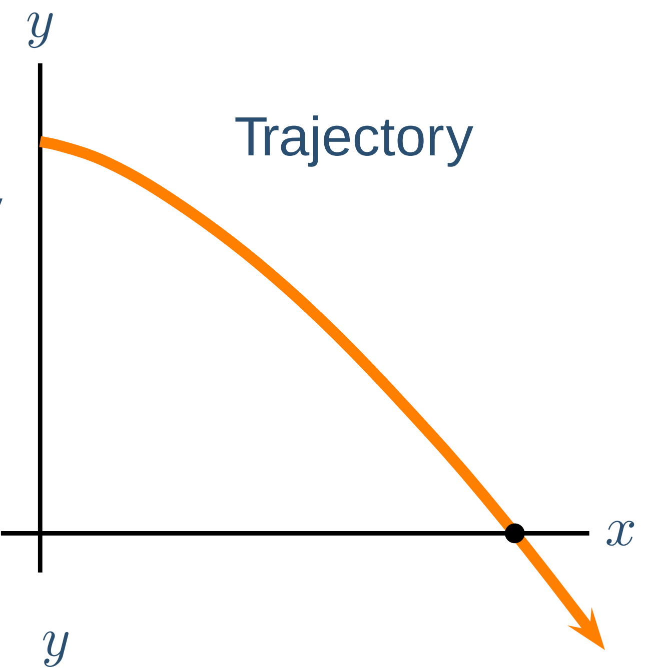

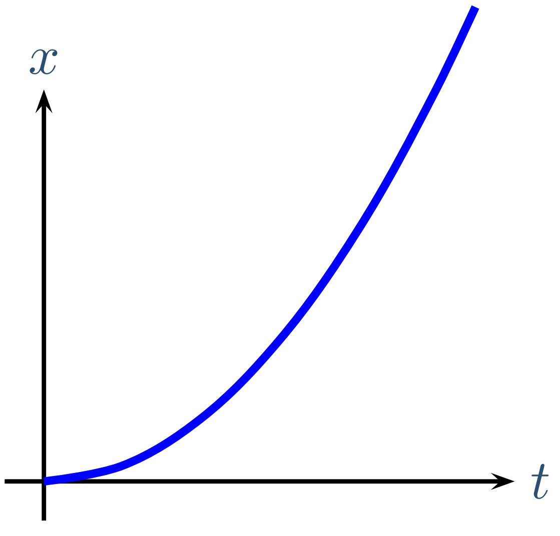

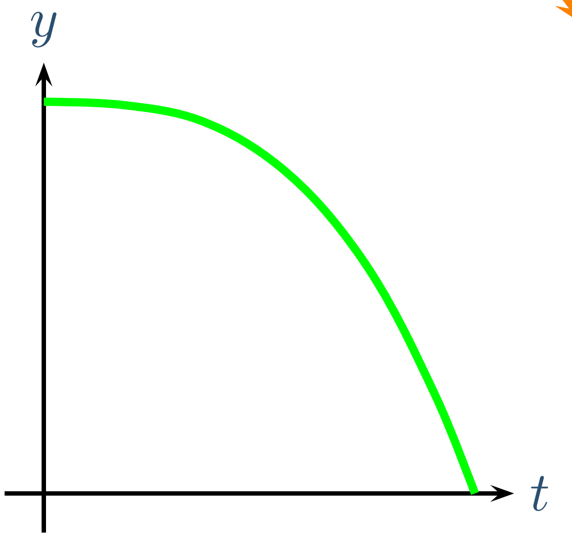

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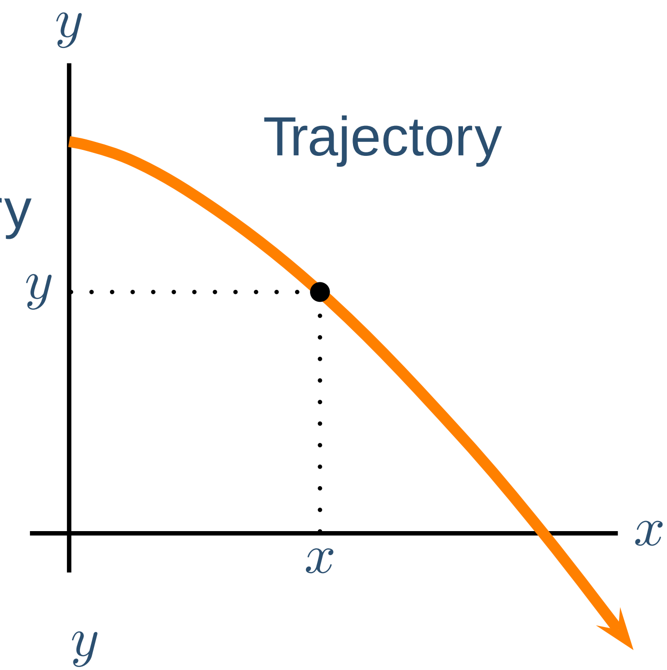

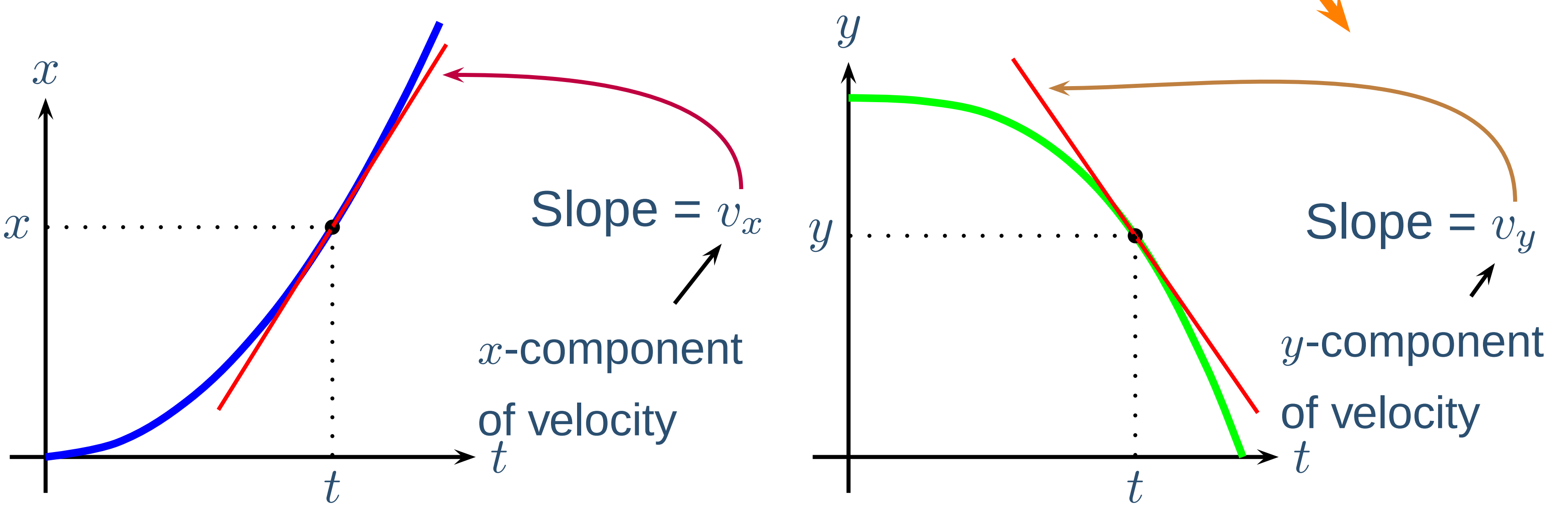

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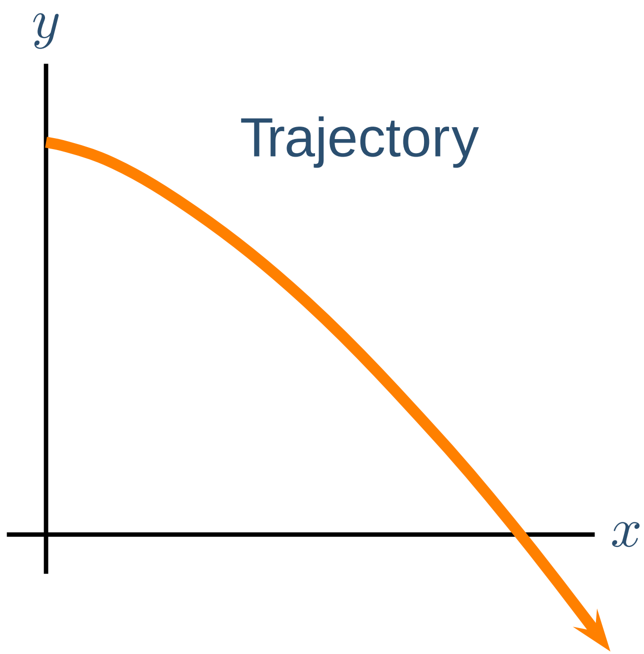

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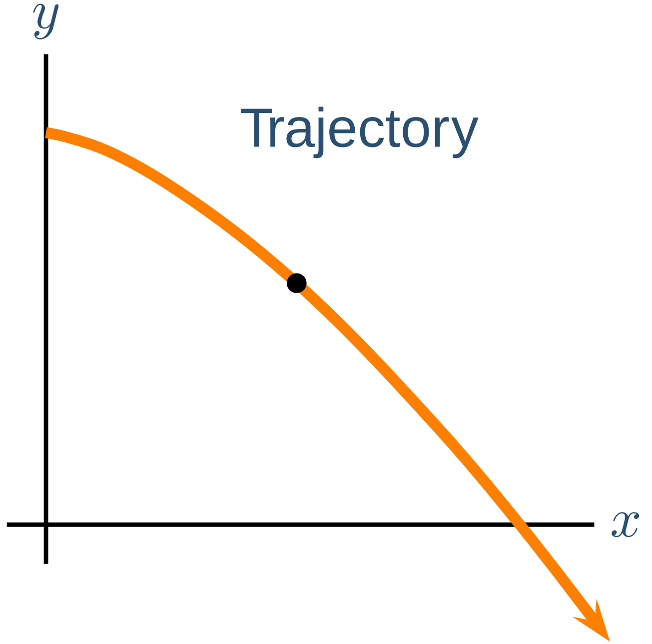

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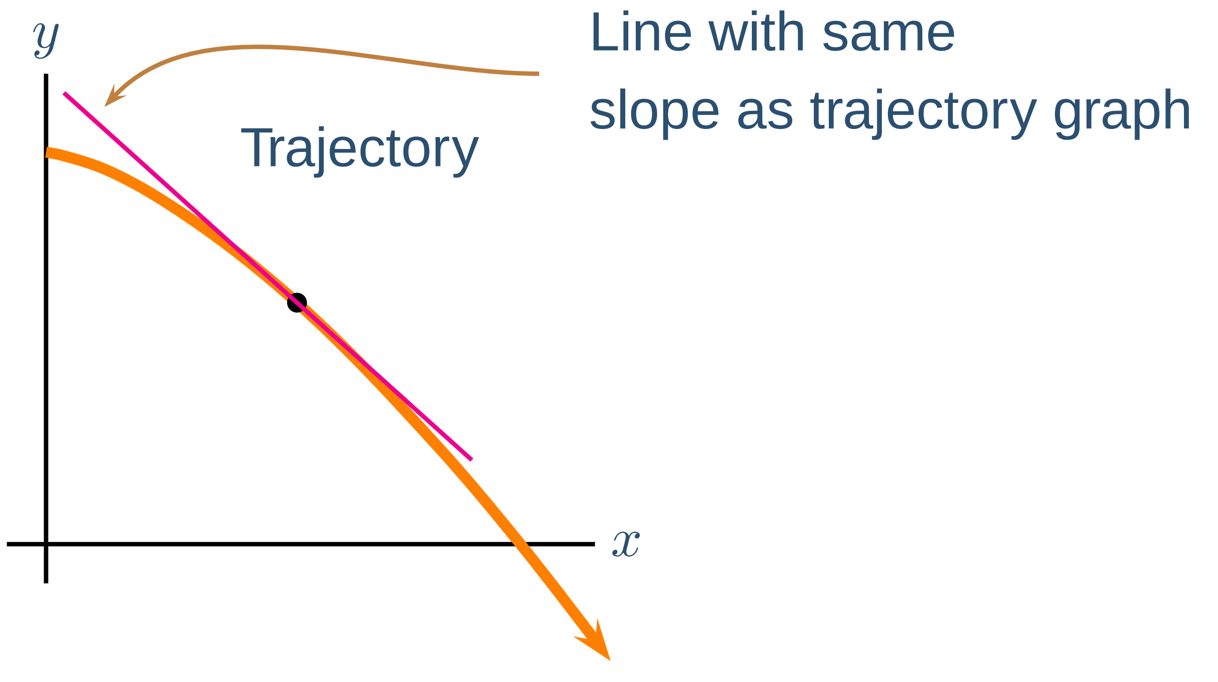

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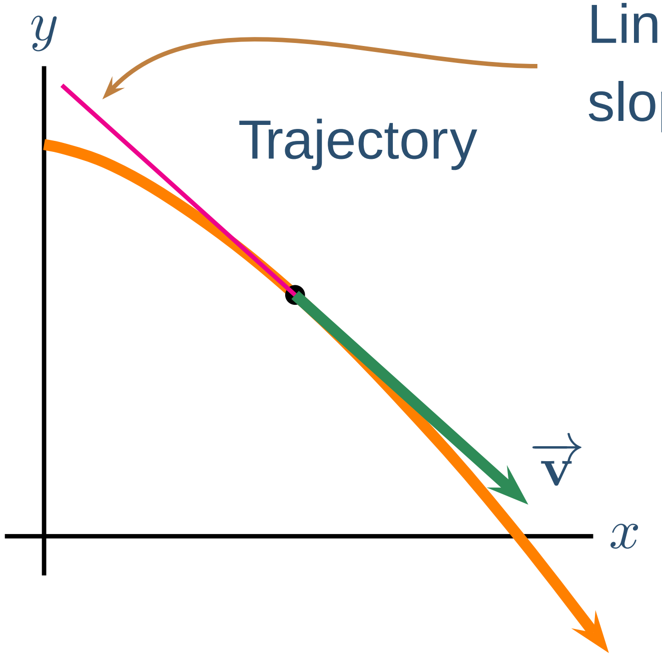

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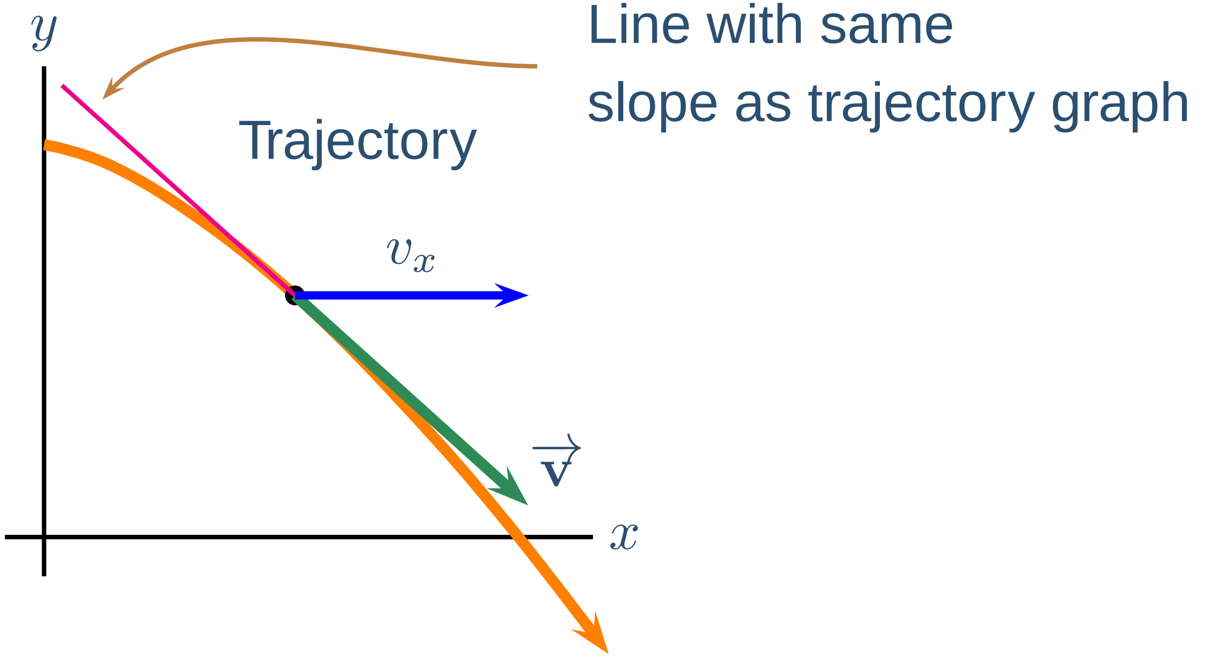

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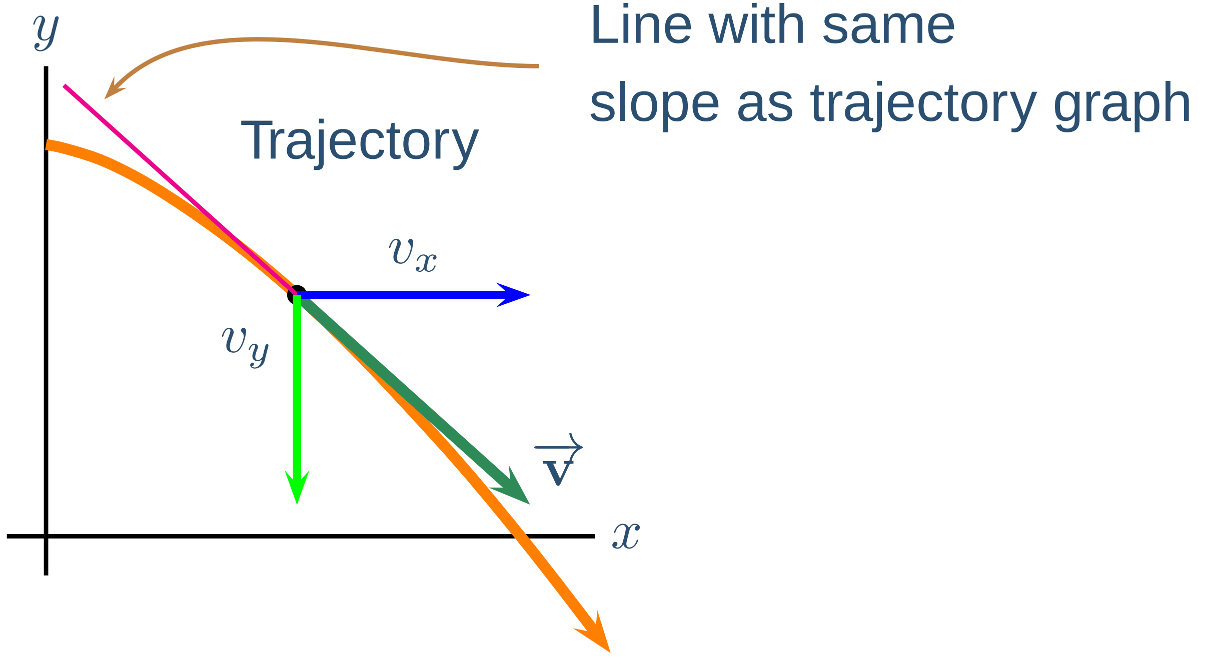

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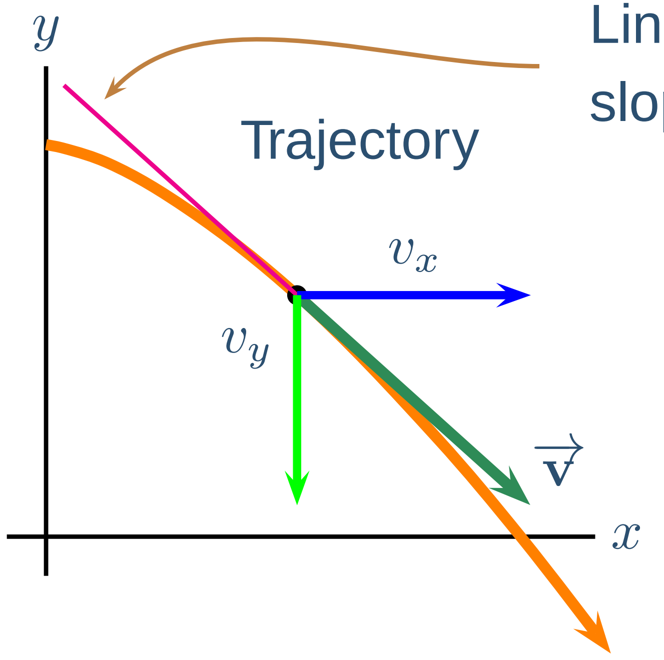

Line with same slope as trajectory graph

Speed is the magnitude of the velocity vector

$$\Rightarrow \boxed{v = \sqrt{v_x^2 + v_y^2}}$$

Acceleration Components

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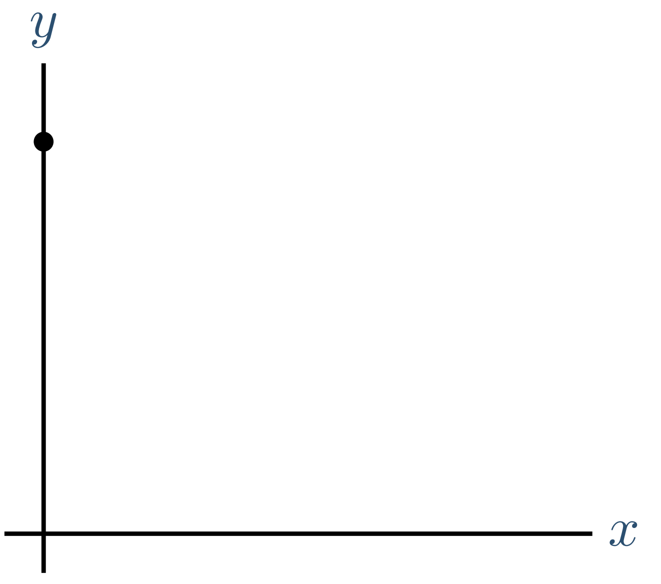

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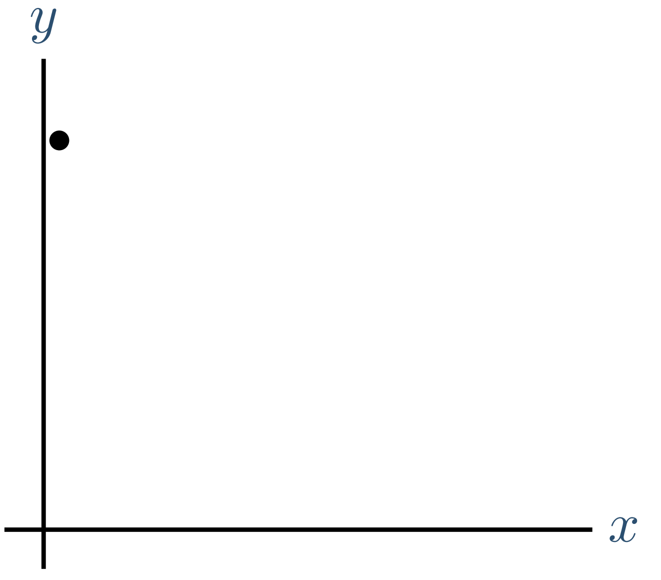

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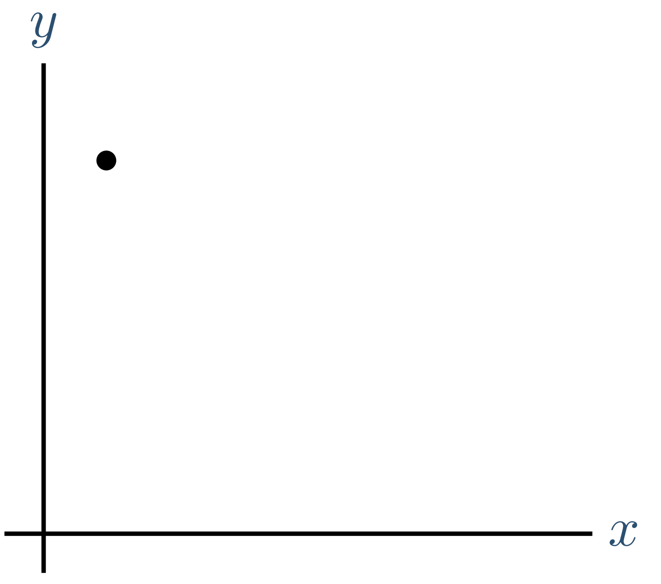

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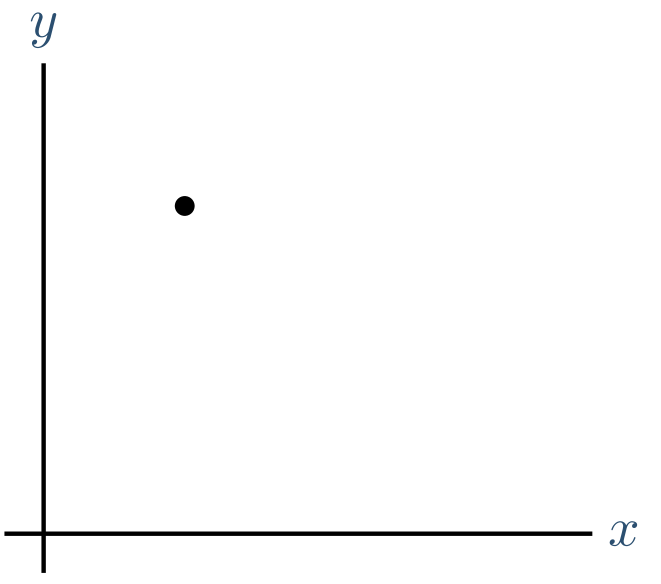

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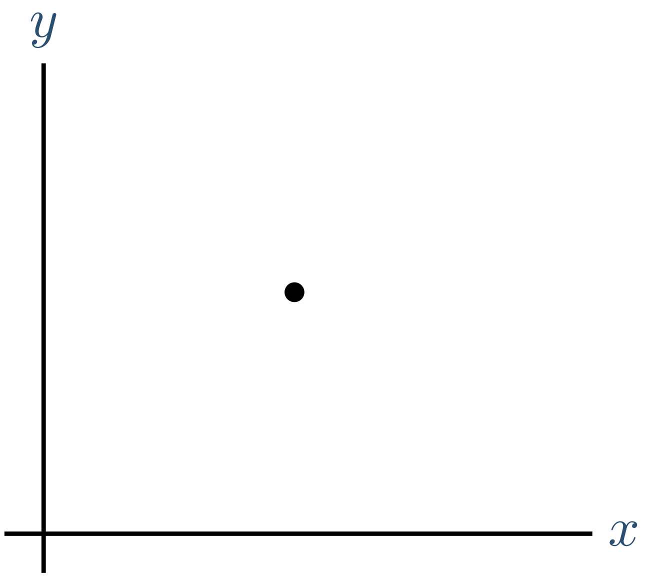

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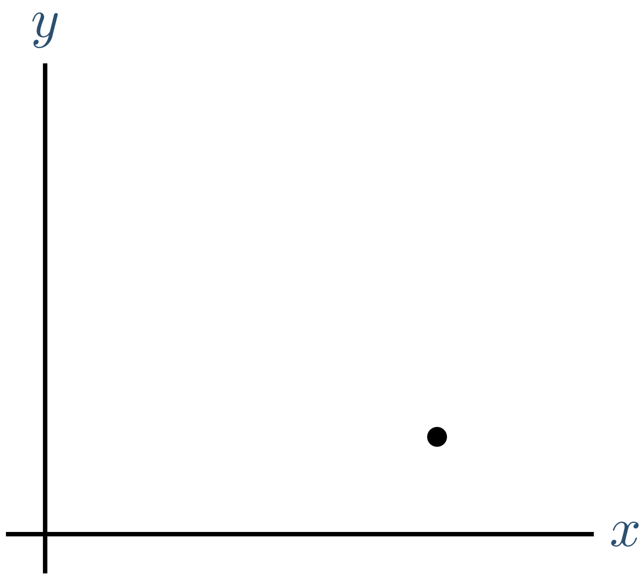

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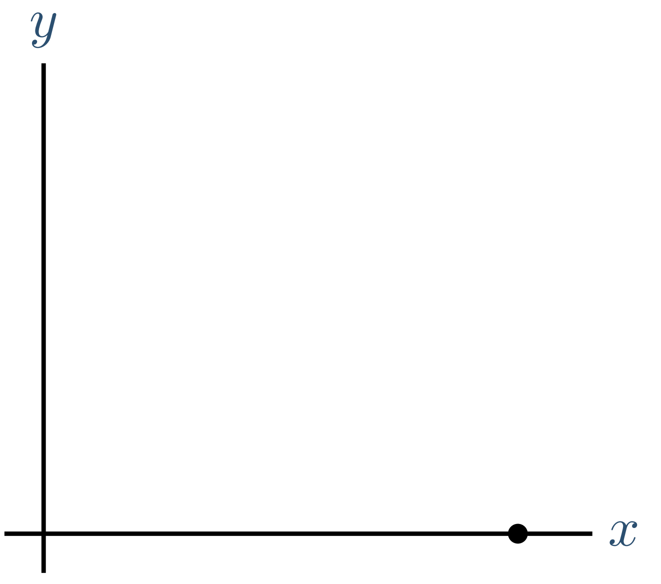

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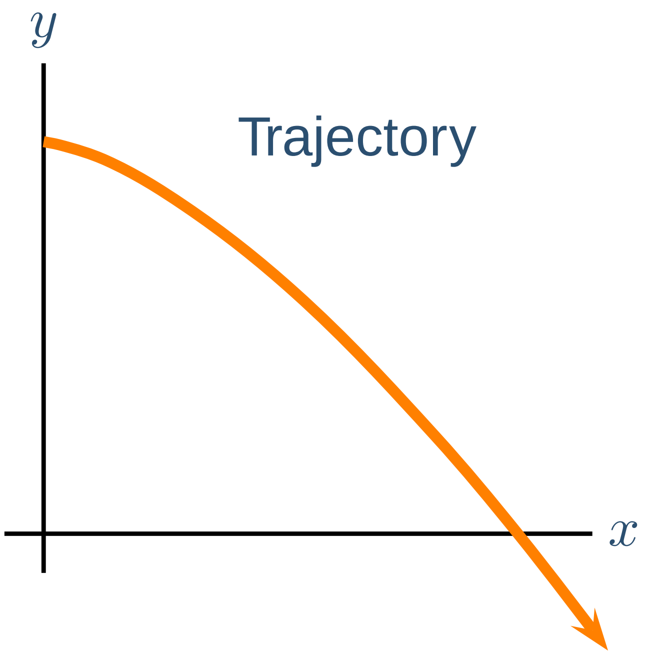

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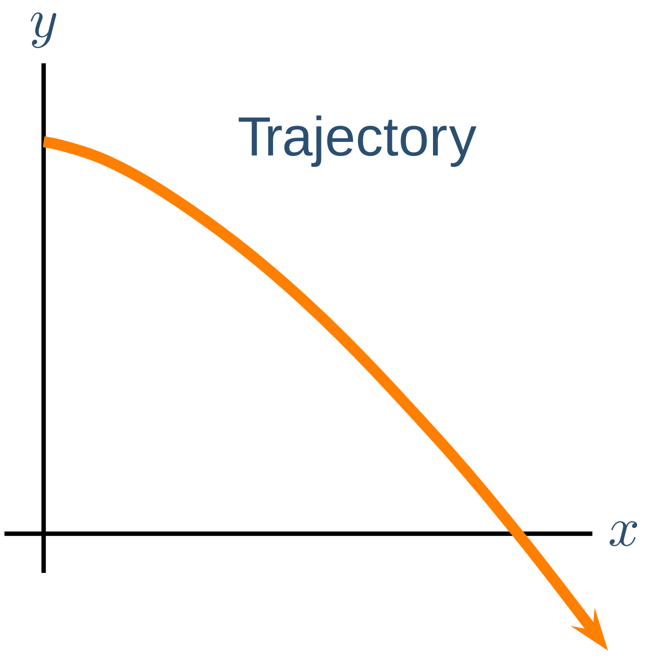

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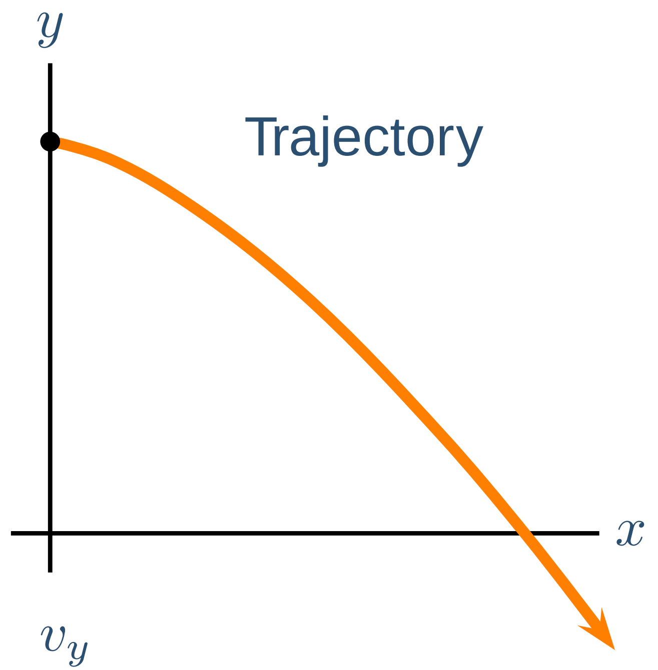

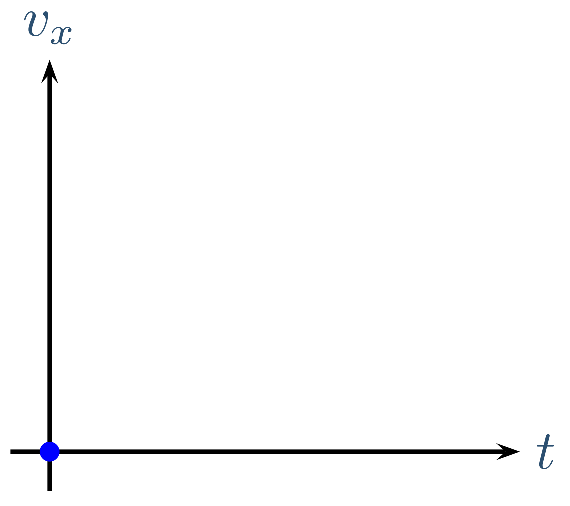

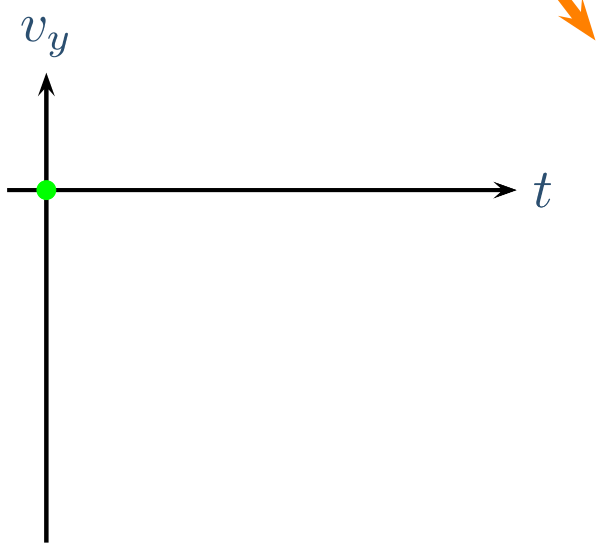

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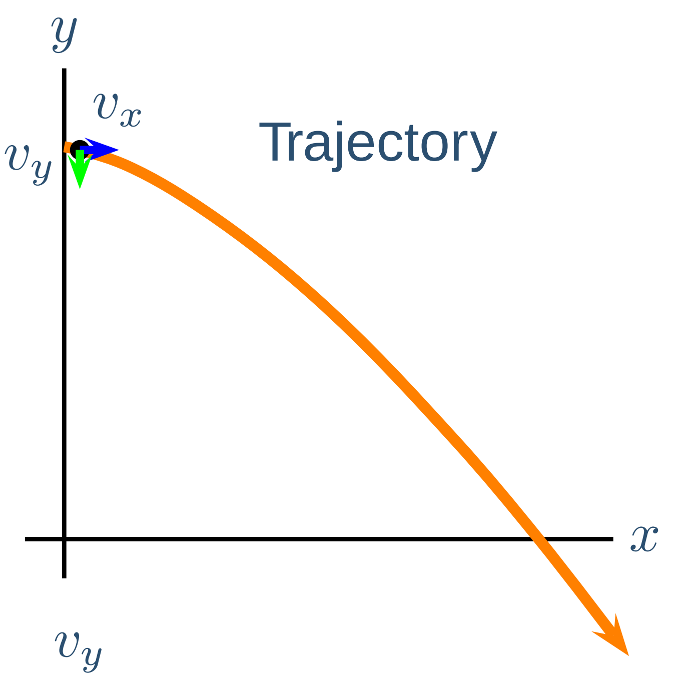

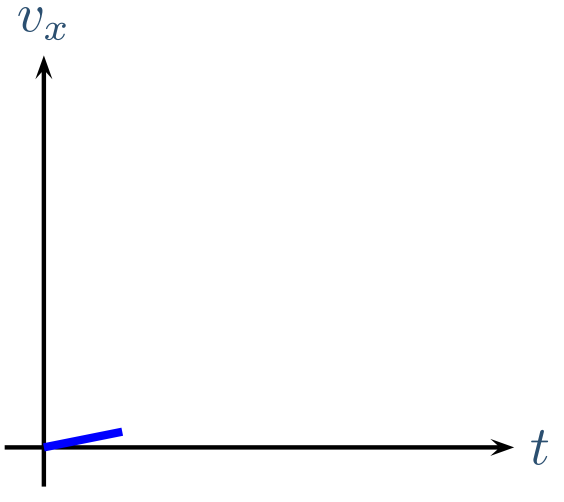

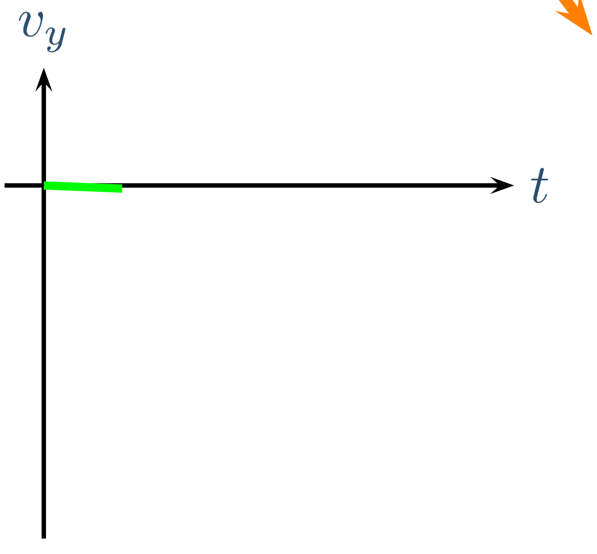

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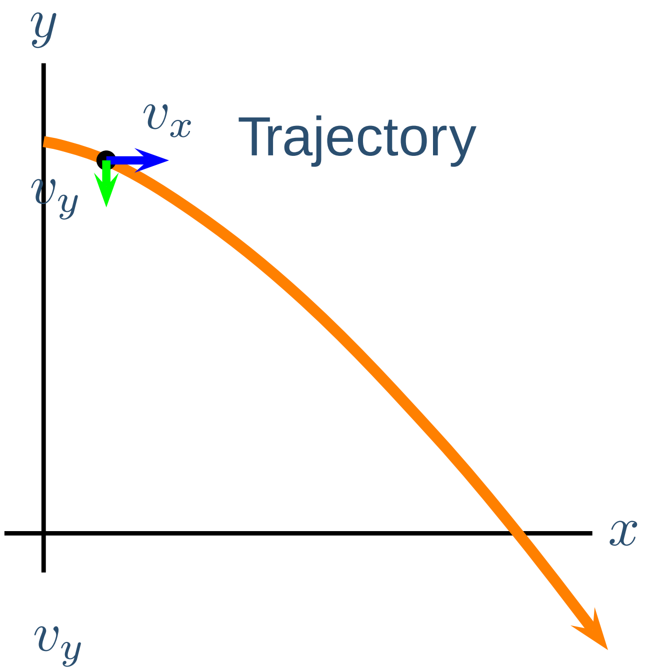

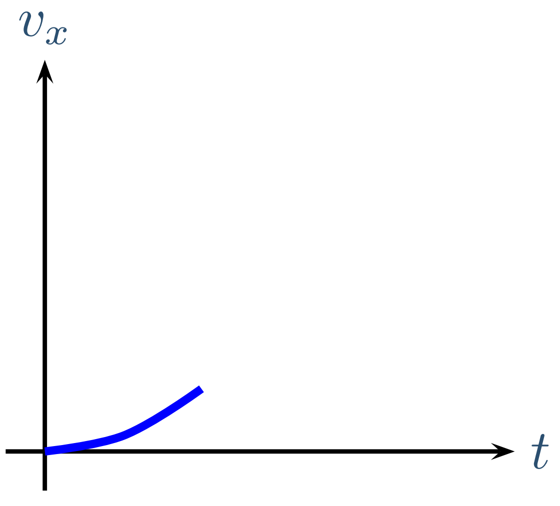

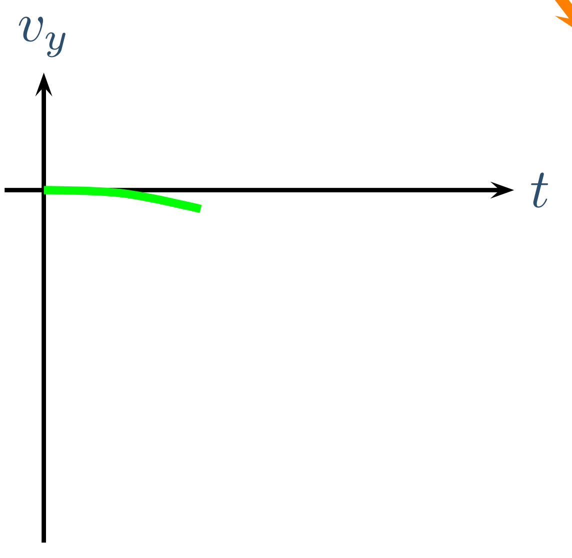

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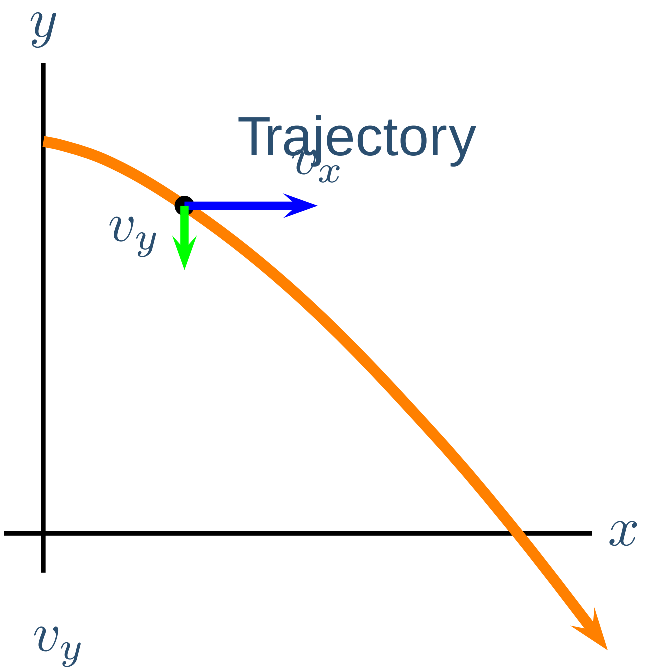

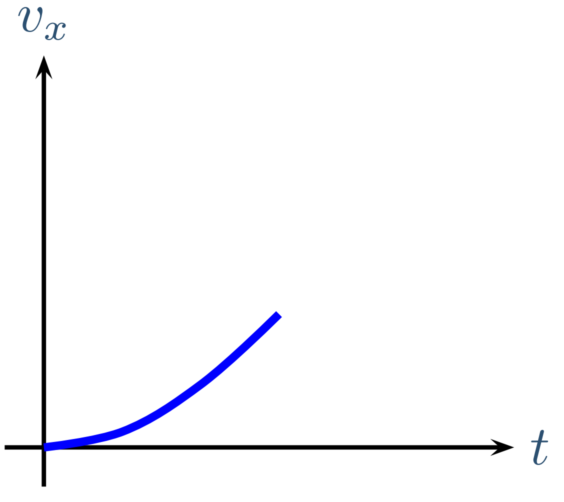

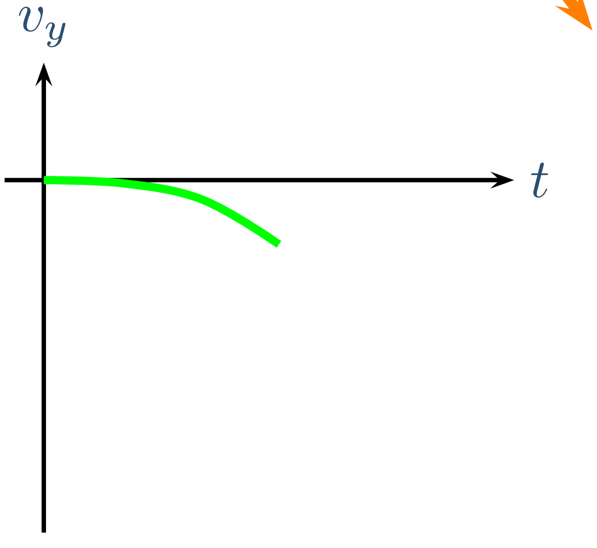

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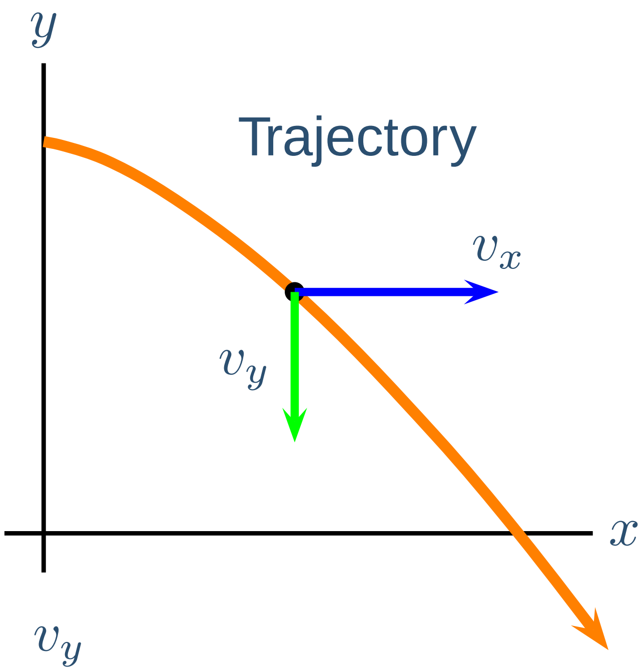

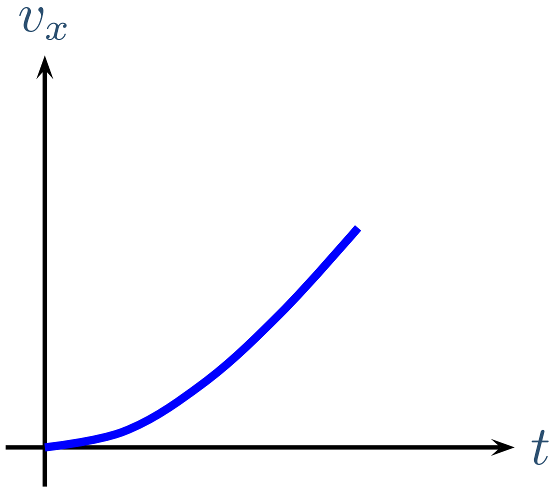

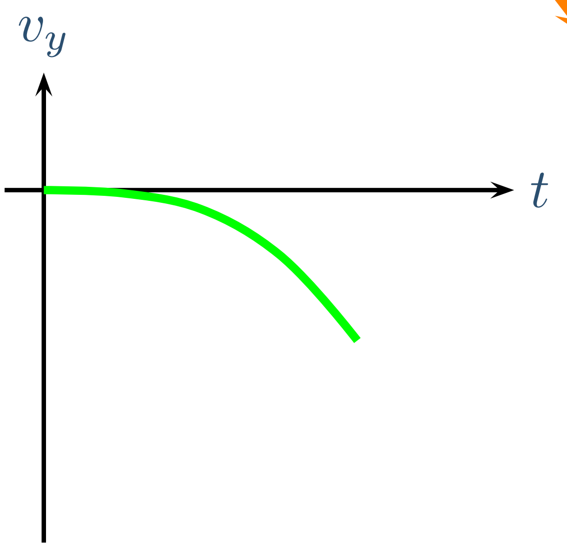

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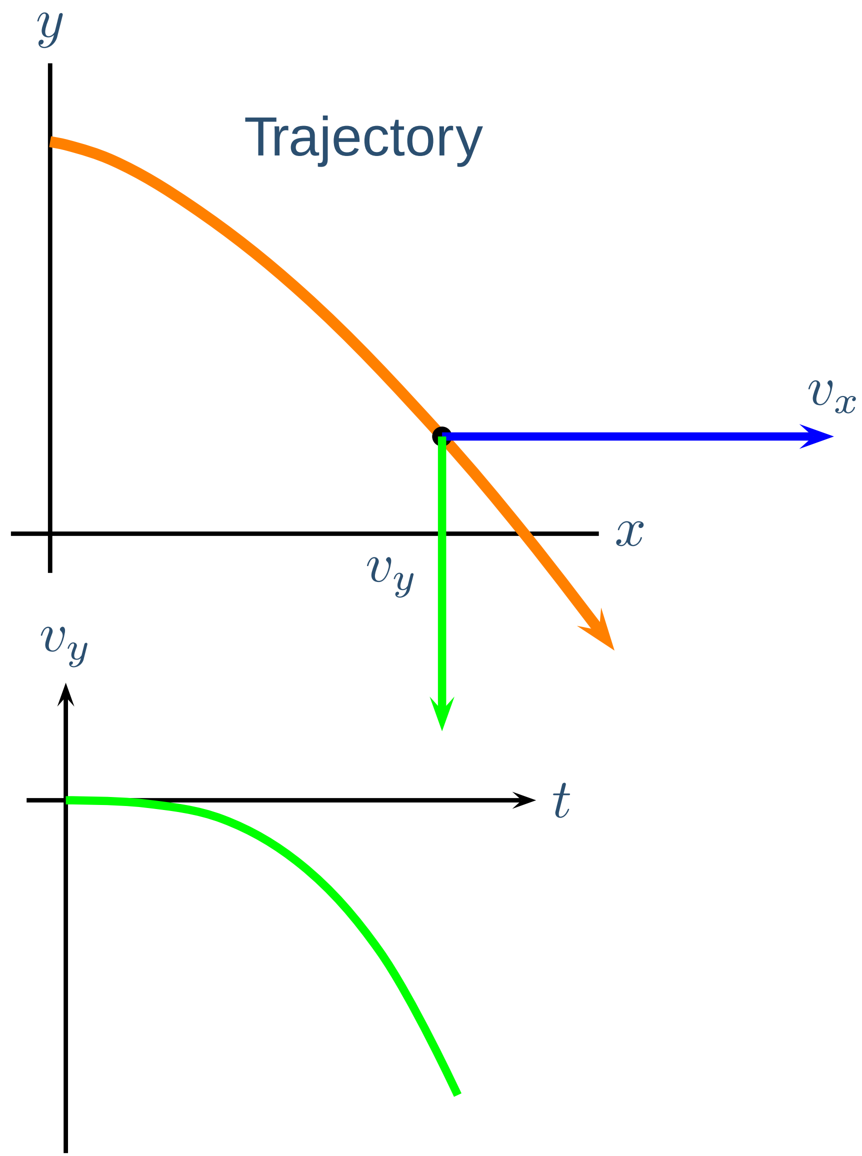

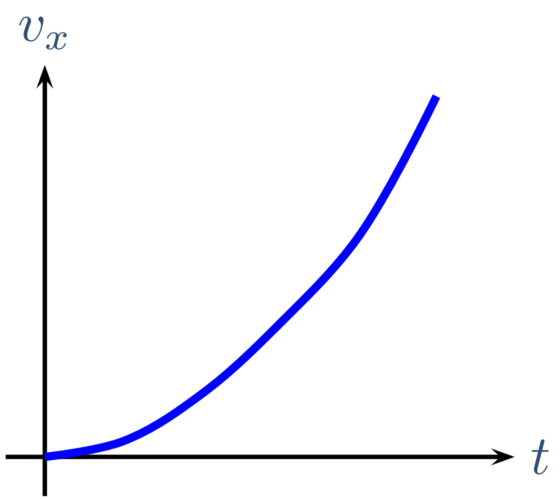

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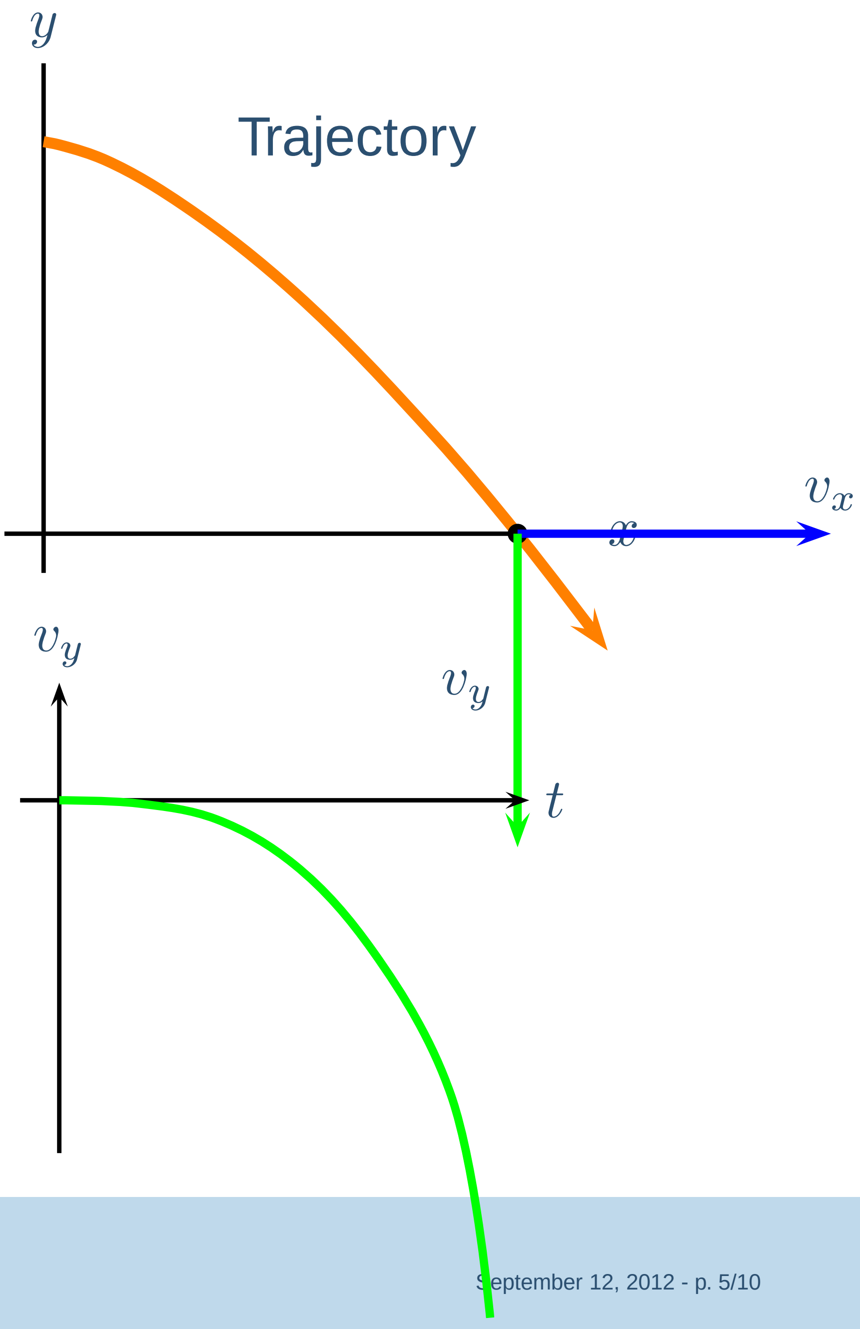

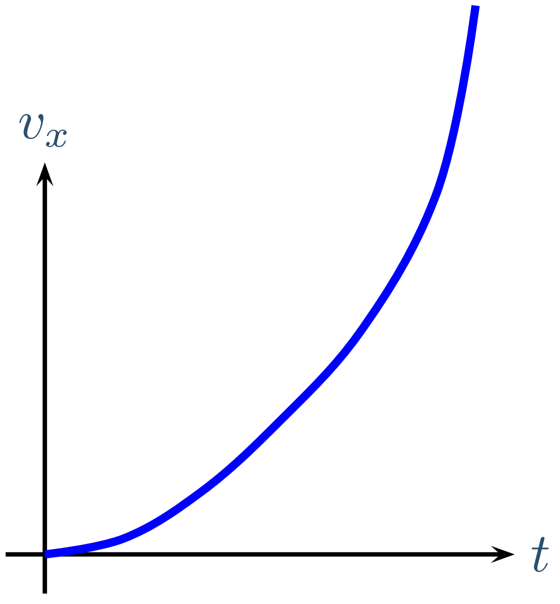

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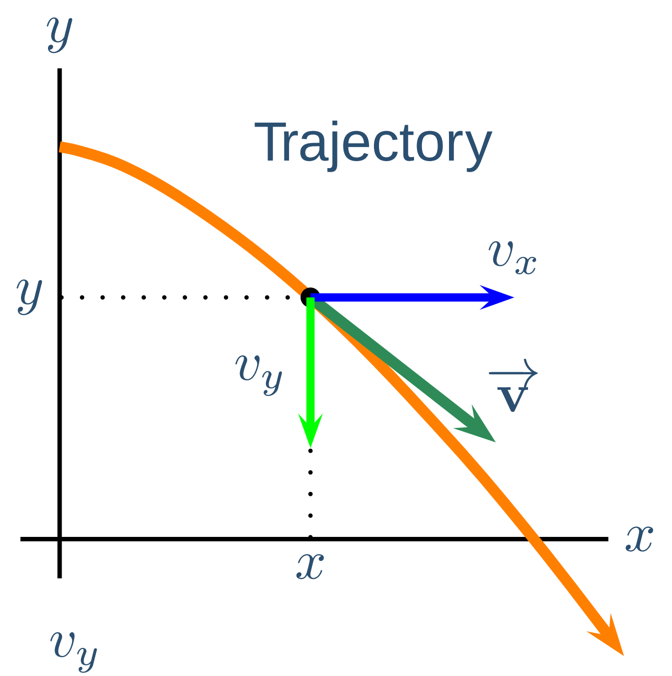

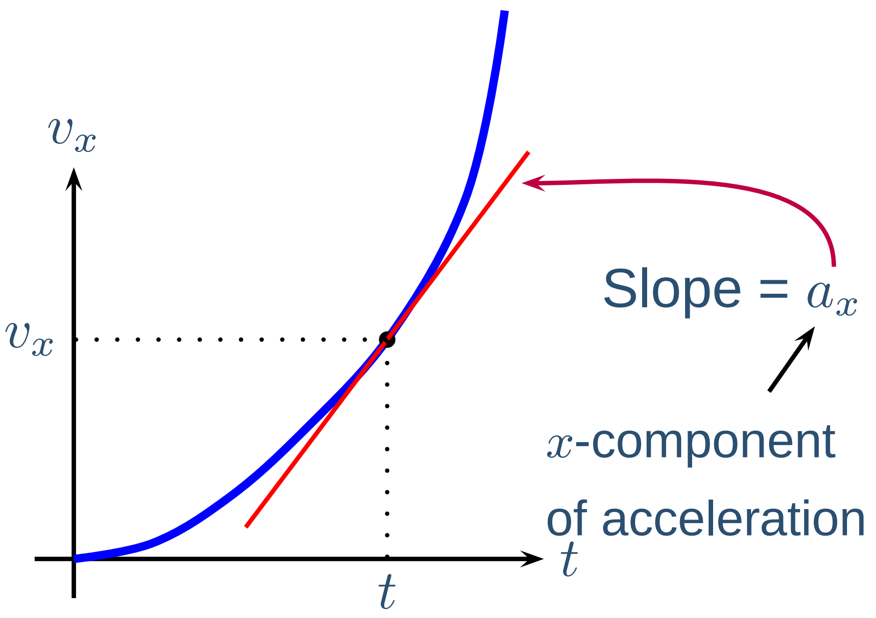

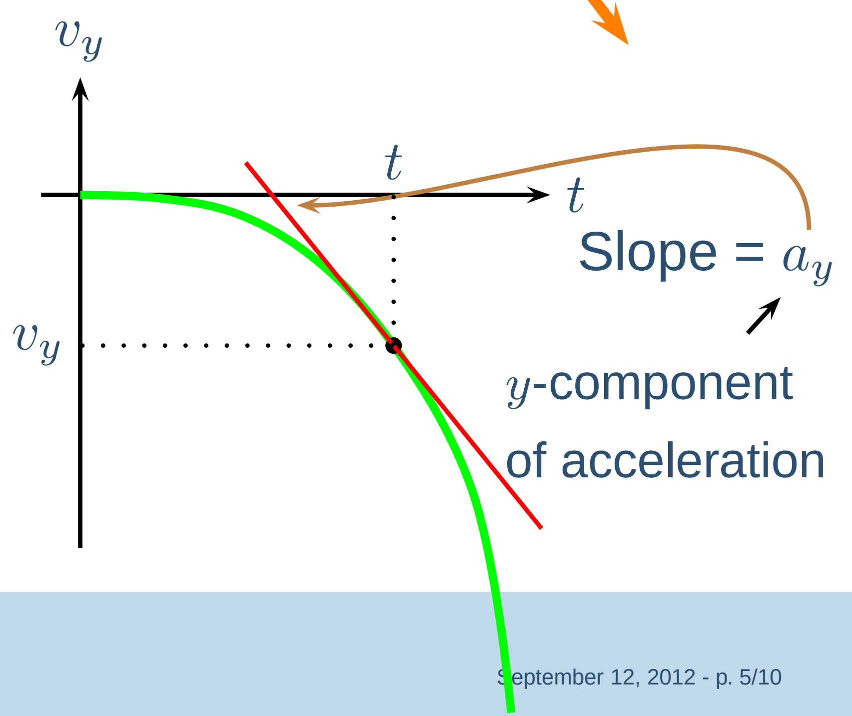

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Gravity pulls straight down, so it causes acceleration in the y-direction only.

$$a_x = 0, a_y = -g \quad (\text{Down is negative })$$

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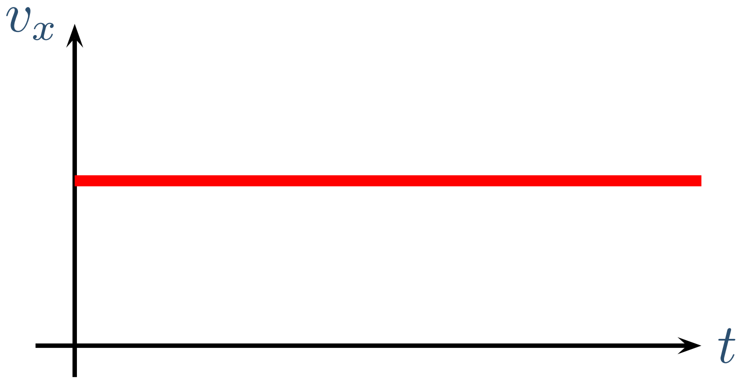

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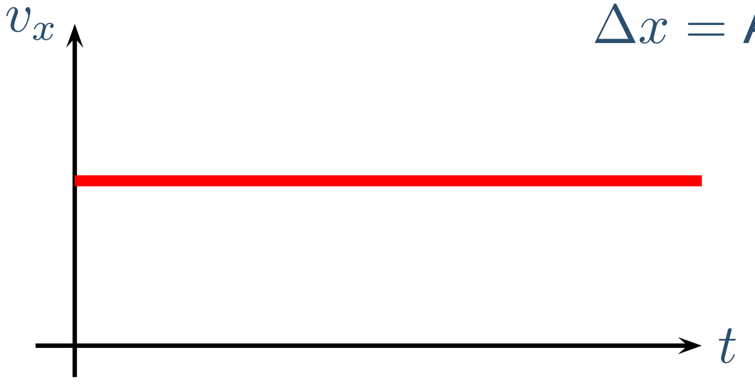

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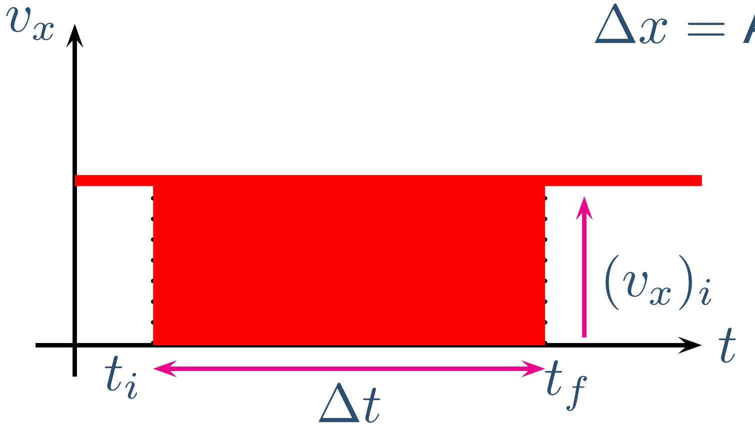

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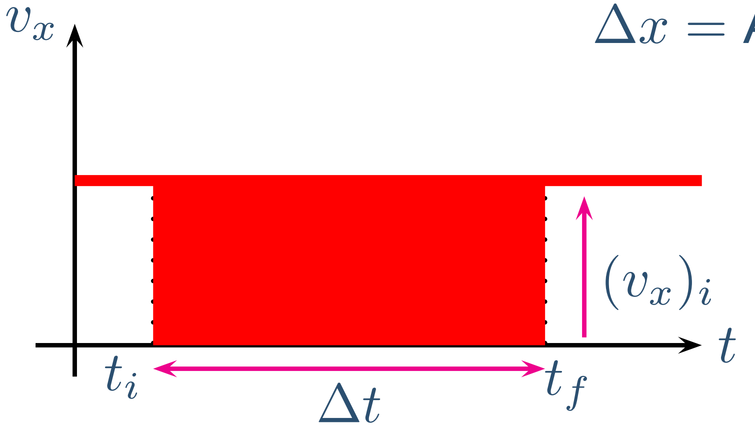

$$\Delta x = \text{Area} \Rightarrow \boxed{x_f = x_i + (v_x)_i \Delta t}$$

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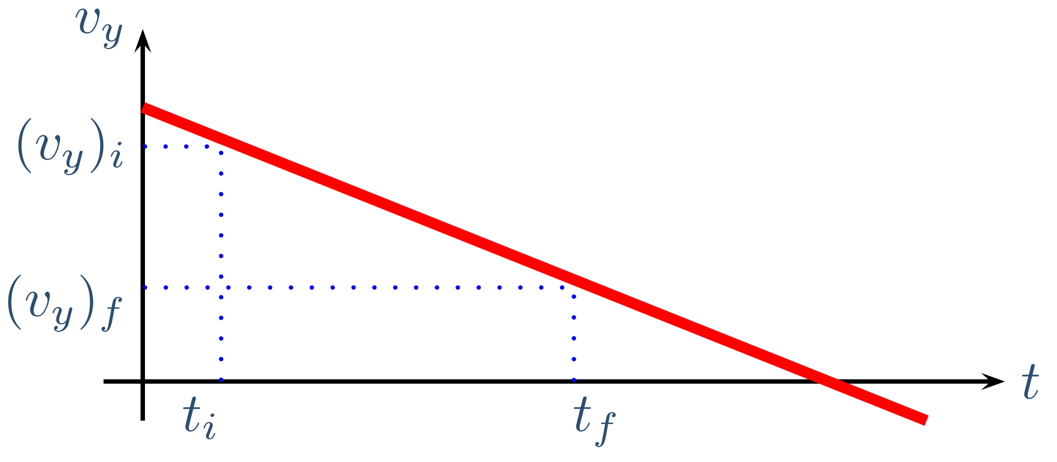

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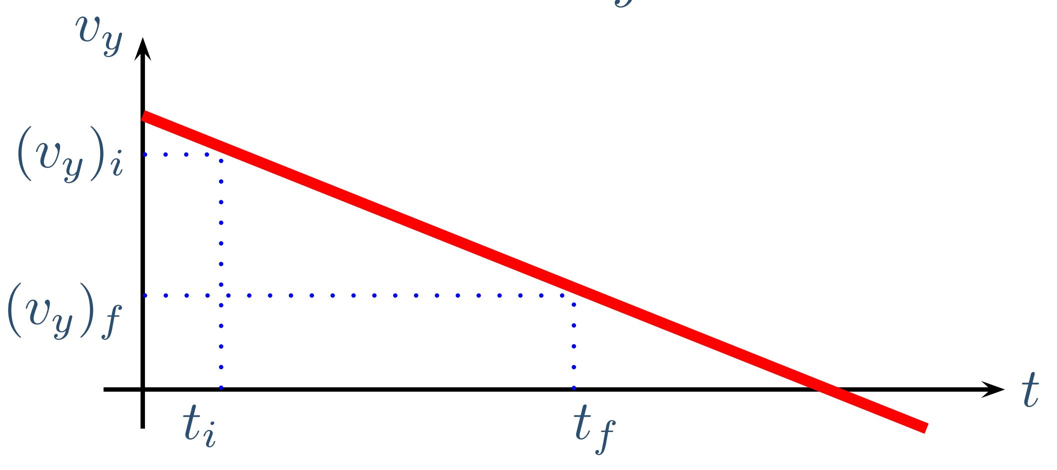

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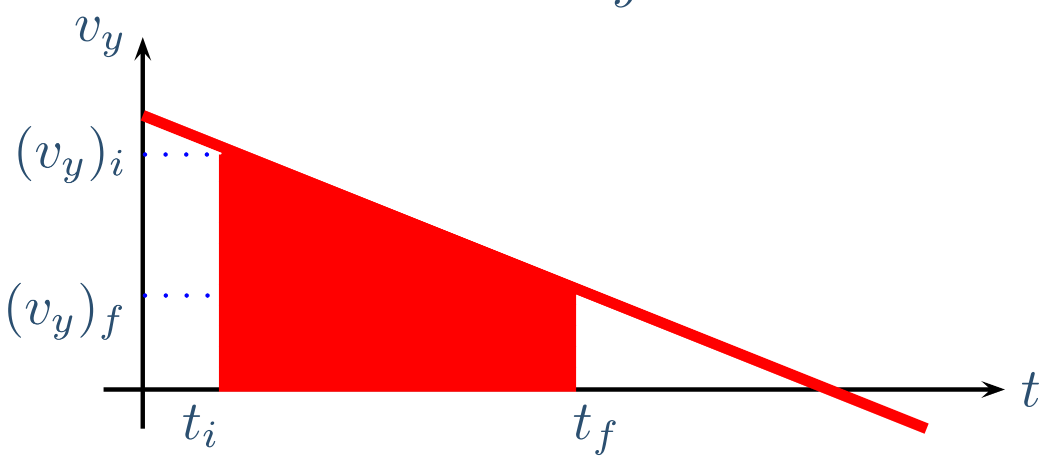

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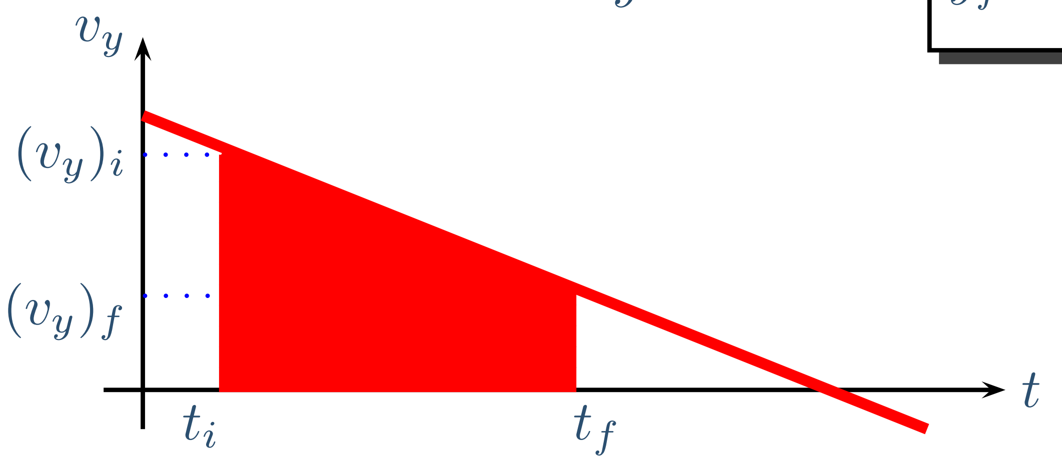

In both of these equations $g = +9.8\,m/s^2$.

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$(v_x)_i$ and $(v_y)_i$ are the components of the initial velocity vector. Usually, we are given the launch speed, v_i and angle, θ.

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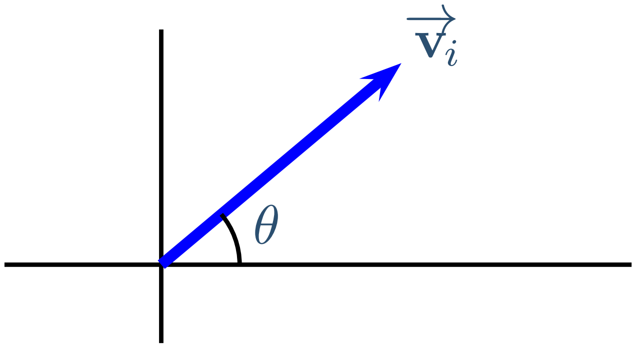

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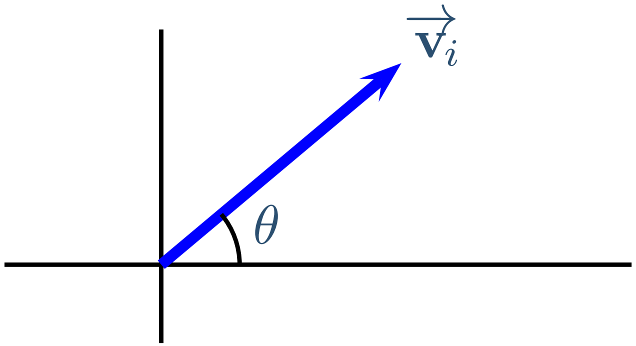

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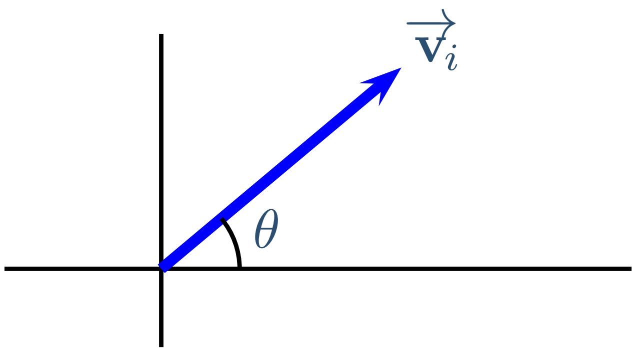

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Summary

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$x_f = x_i + (v_x)_i \Delta t$	$y_f = y_i + (v_y)_i \Delta t - \frac{1}{2} g \Delta t^2$
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