Graphing
Wilfrid Laurier University

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Wilfrid Laurier University

December 12, 2014

Overview

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In this document, you'll learn:

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- why $x - y$ graphs are useful

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- why $x - y$ graphs are useful
- how to show uncertainties on $x - y$ graphs
- what kind of lines or curves are meaningful and should be shown on a graph

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- A **graph** is a visual representation of such a relationship.

- A graph will usually contain both data points and a **fitted curve** showing the function which the data should follow.

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- The term "curve" may include a straight line.
- In fact, it is often easiest to interpret results when an equation has been **linearized** so that the graph should be a straight line.

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- include the information required for any numerical data, ie. units, uncertainties, etc.

Sample data table:

i	x_i	Δx_i	t_i	Δt_i
	(cm)		(s)	
1	0.40	0.03	0.0	0.1
2	0.77	0.04	2.0	0.1
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Table 1: Block sliding down a ramp

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- Units in the table should be the same as on the graph.

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  Good choice;"Object in Free Fall"

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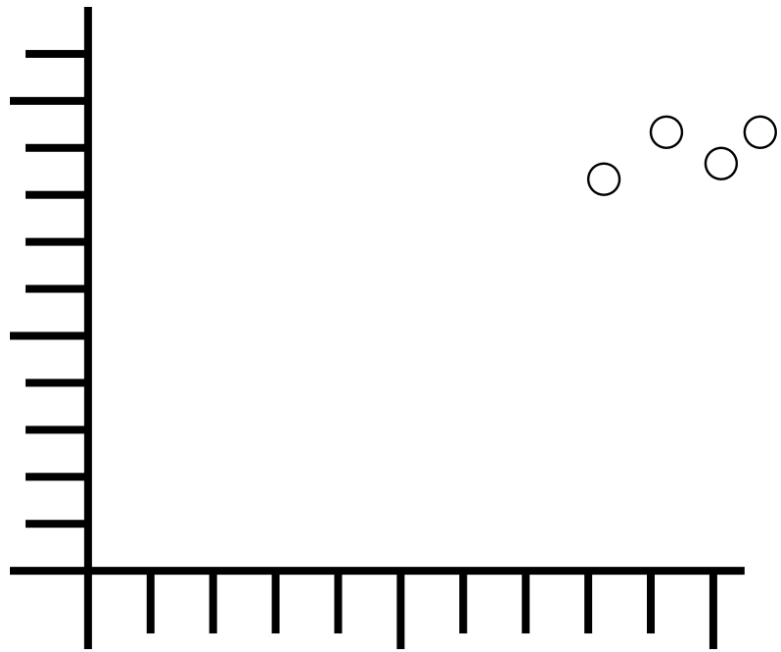
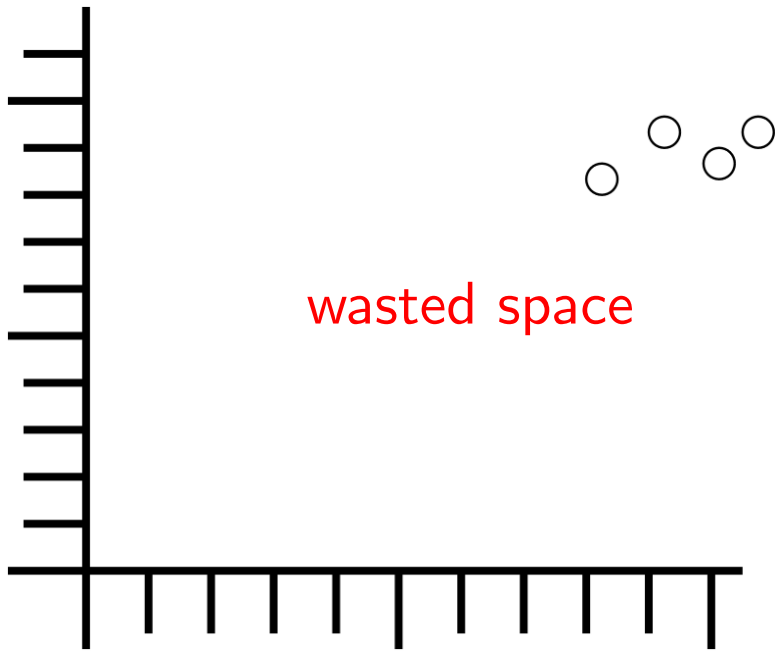
- Units *must* be included with axis labels.



Wrong: Data, (not empty space), should fill most of the graph



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Plotting Points

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Do not connect the points like a dot-to-dot drawing!

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  It's just like any other data point.

  It isn't magic.

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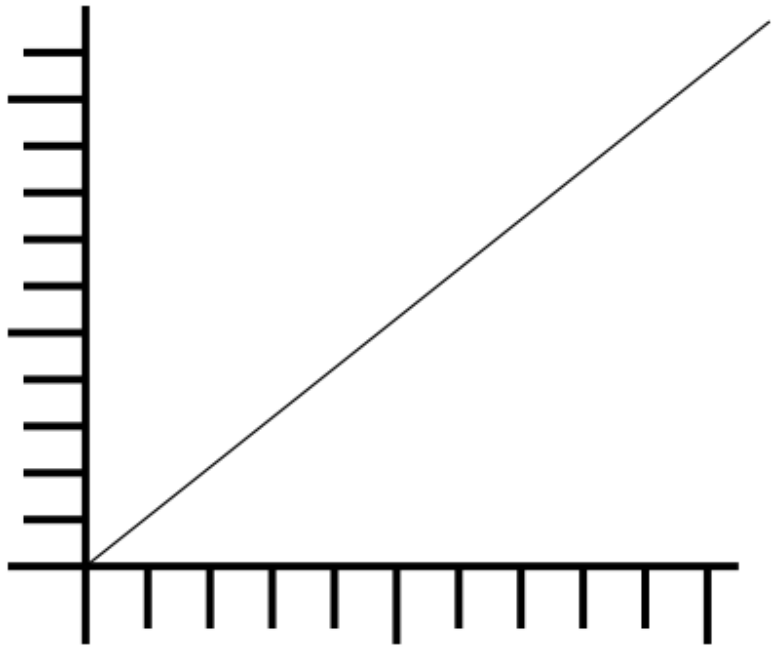
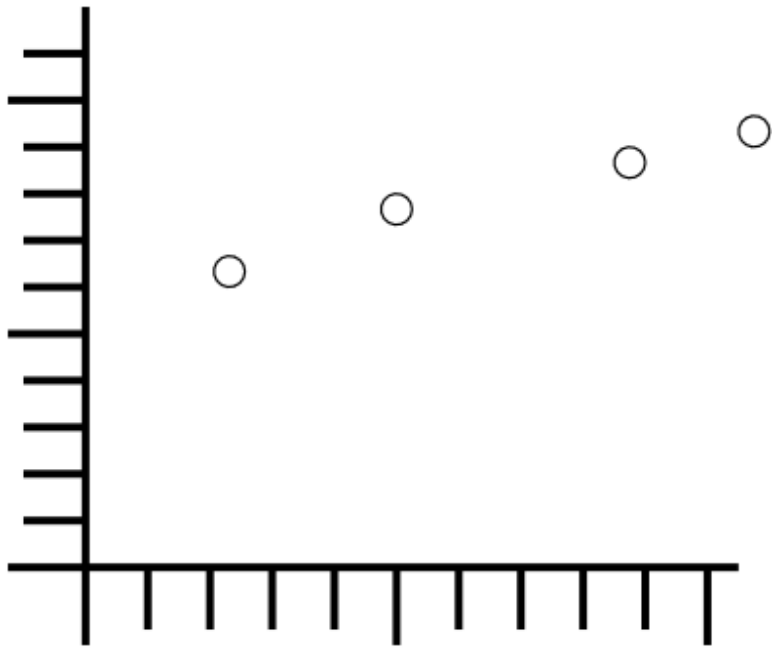
  Don't force the graph through $(0, 0)$ any more than you would through any other point.

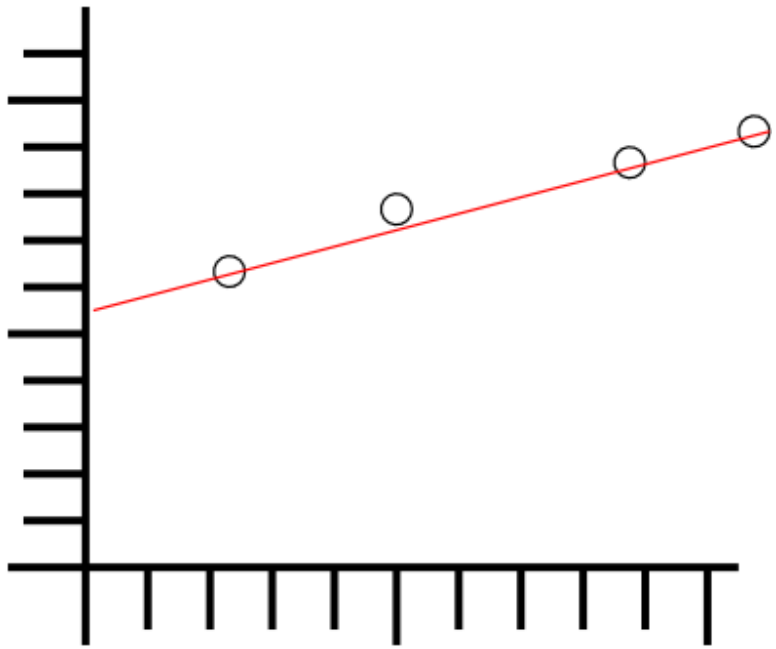
  Doing a least squares fit will protect you from this temptation.



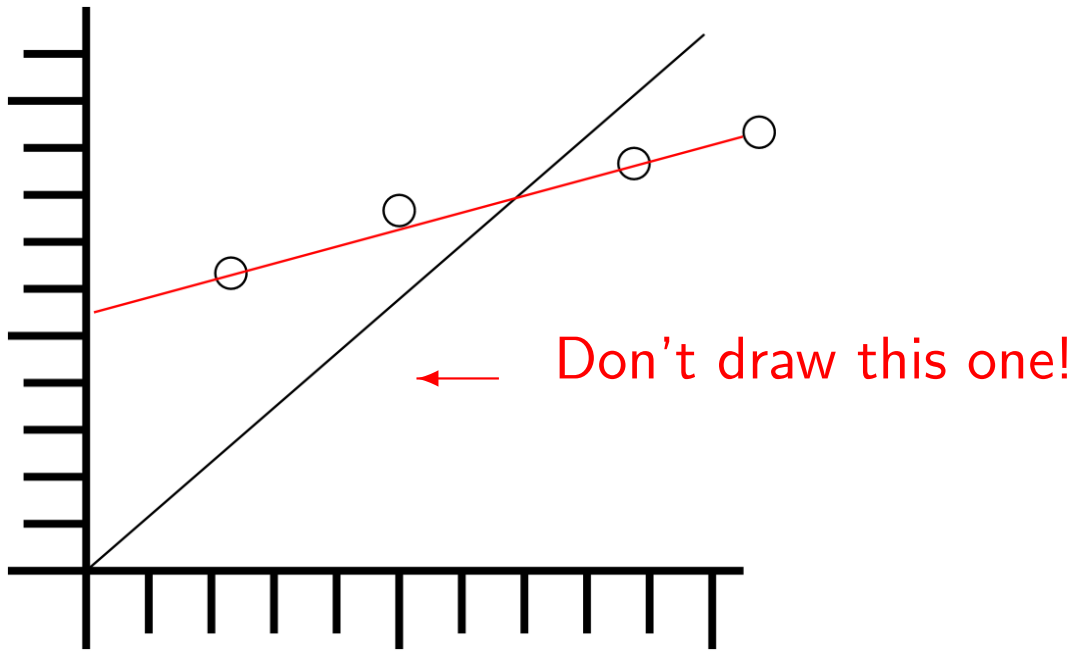
Here's what you expect.



Here are the data.



This is the line of best fit.



A line through the origin is not always the best fit, *even if that's what you expected*.

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Don't just use a polynomial of degree $N-1$ to fit N data points!.

If your curve fits all of the points exactly, you don't have enough data!

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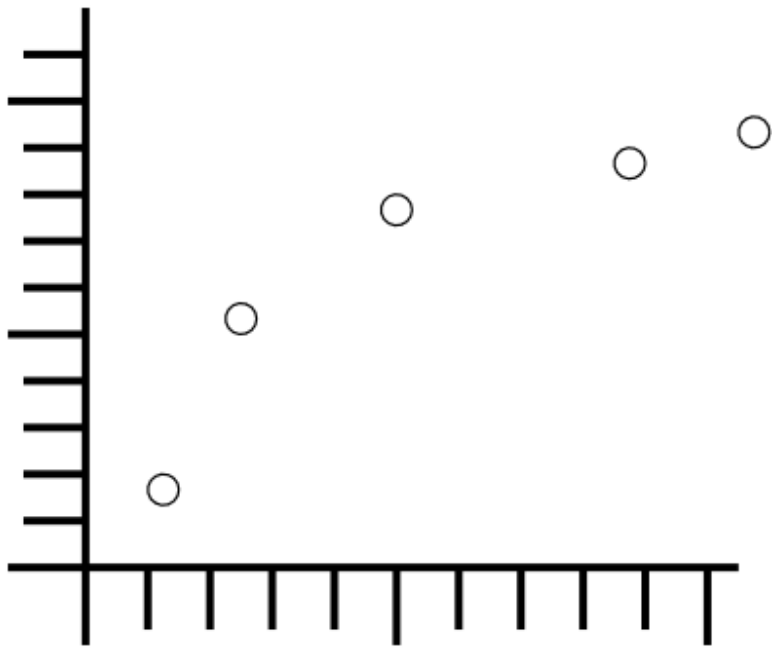

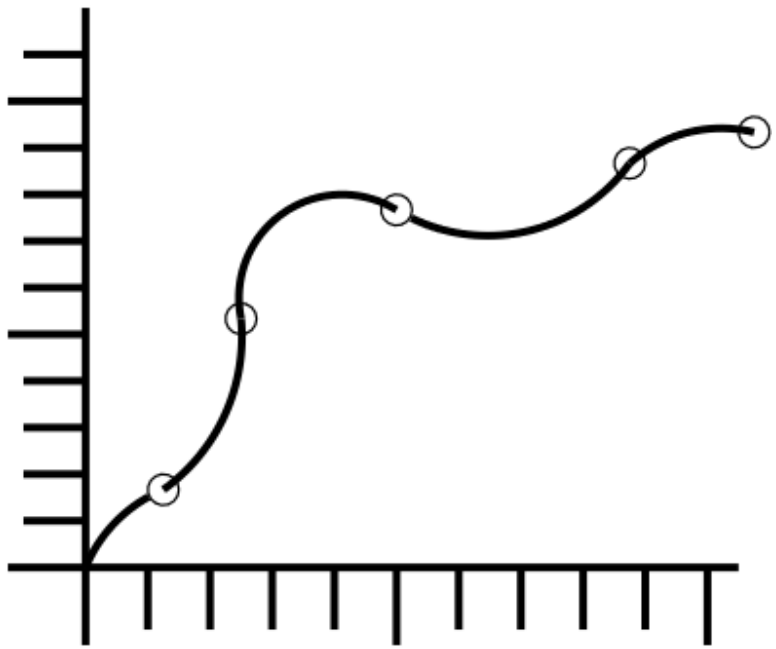

Wrong: Graphs should not have meaningless curves just to fit the data

Do not use an arbitrary function just because it goes through all the data points!

The curve (or line) you draw through your data should be *smooth*,

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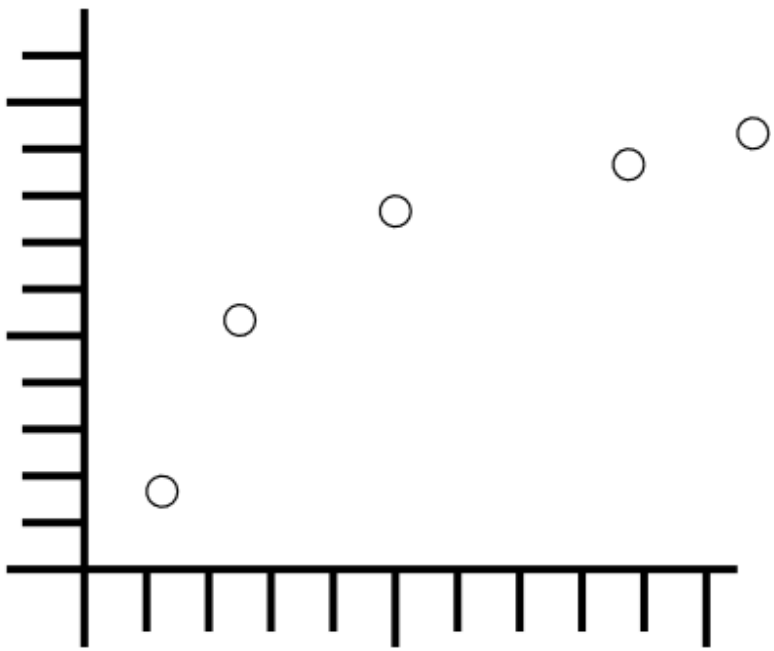
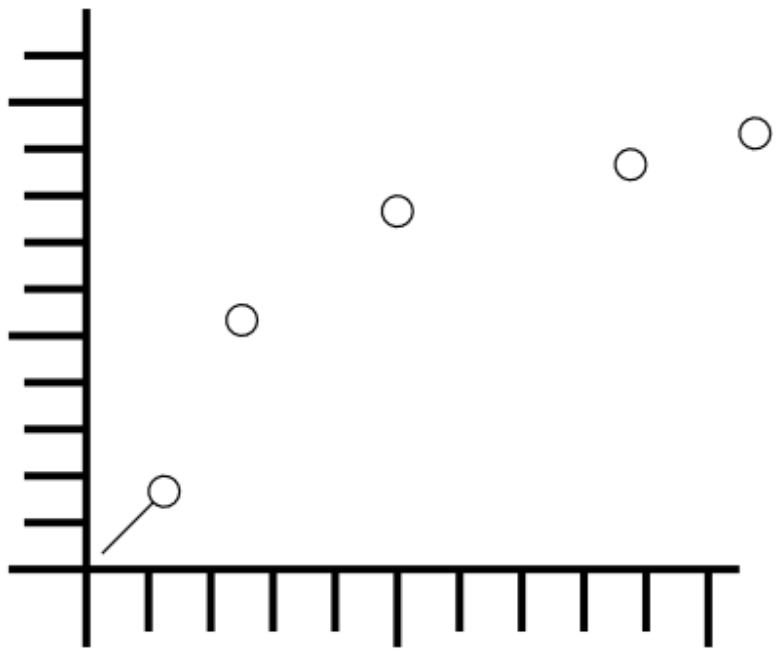


Wrong: Graphs should not look like dot-to-dot drawings



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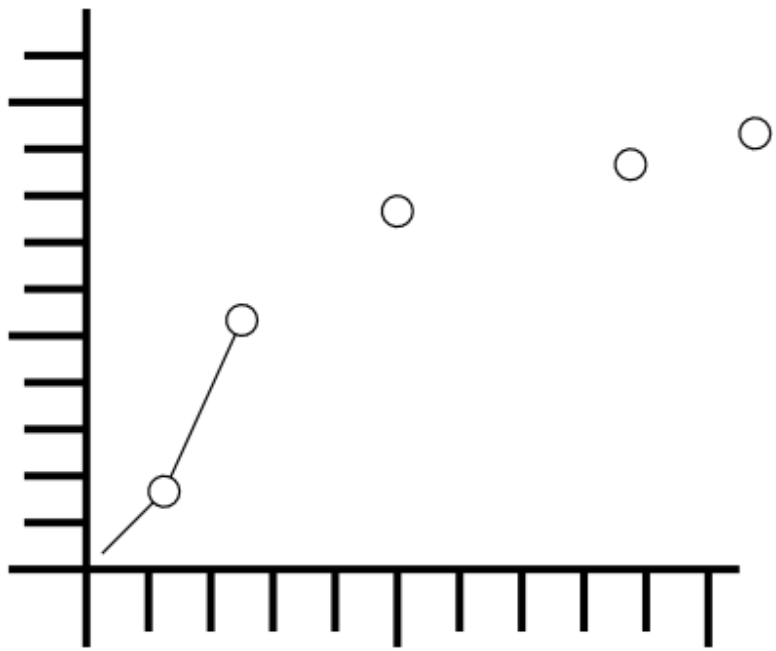

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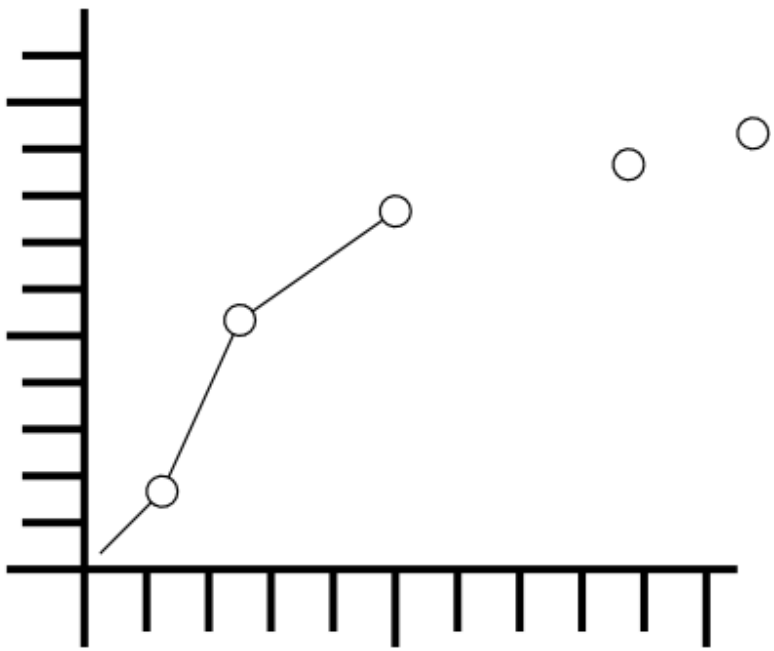

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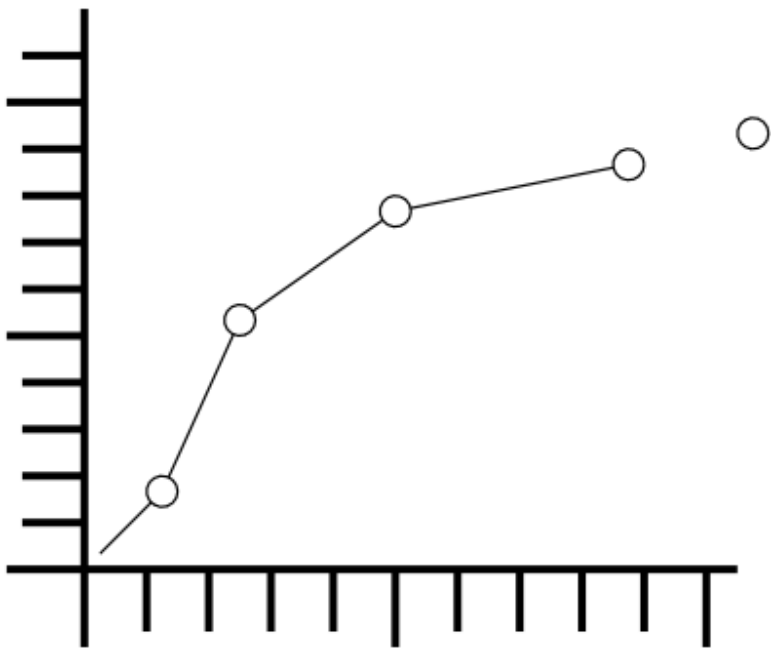

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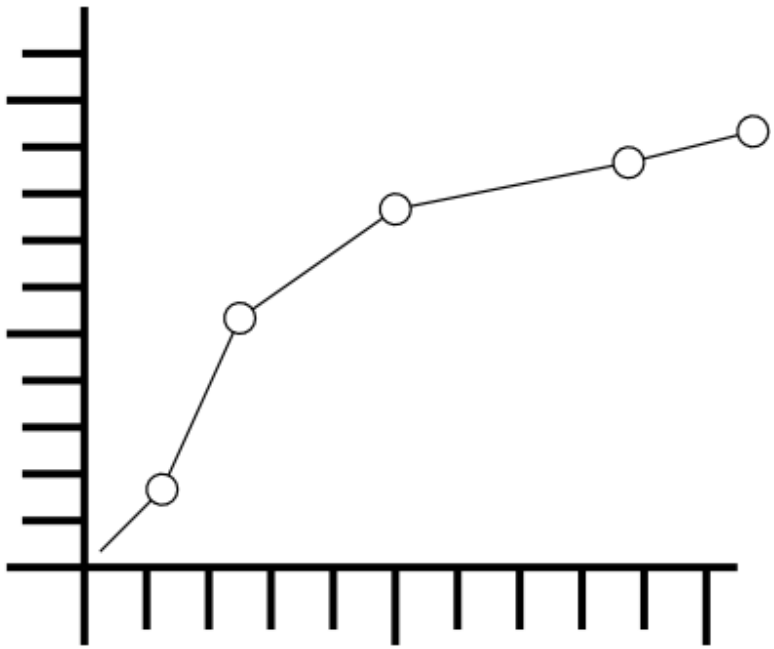

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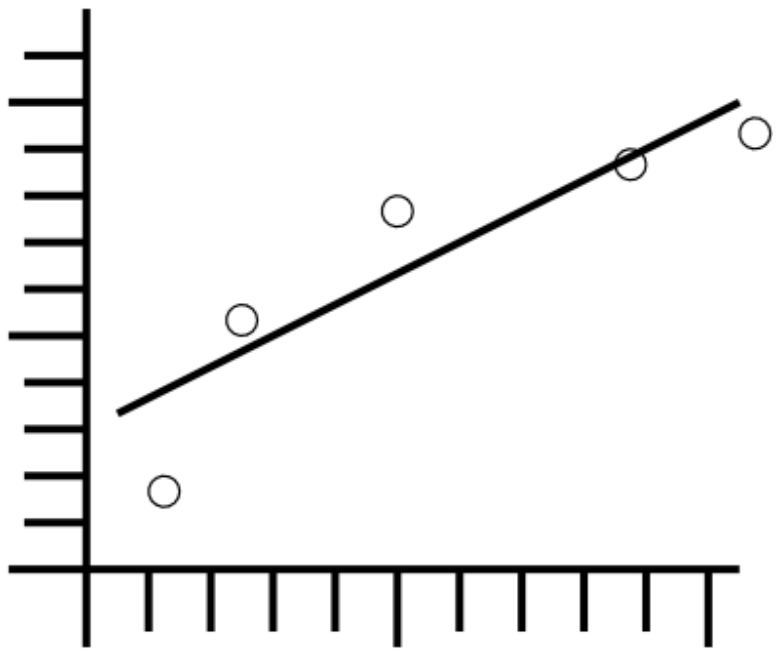

Right: The curve or line should be smooth

Your graphs should not look like a dot–to–dot drawing.

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   Lines or curves shown on the graph should reflect underlying trends in the data, rather than specific data values or mathematical expectations.