

Statistics with Spa OWS

Lecture 8

Julia Schroeder

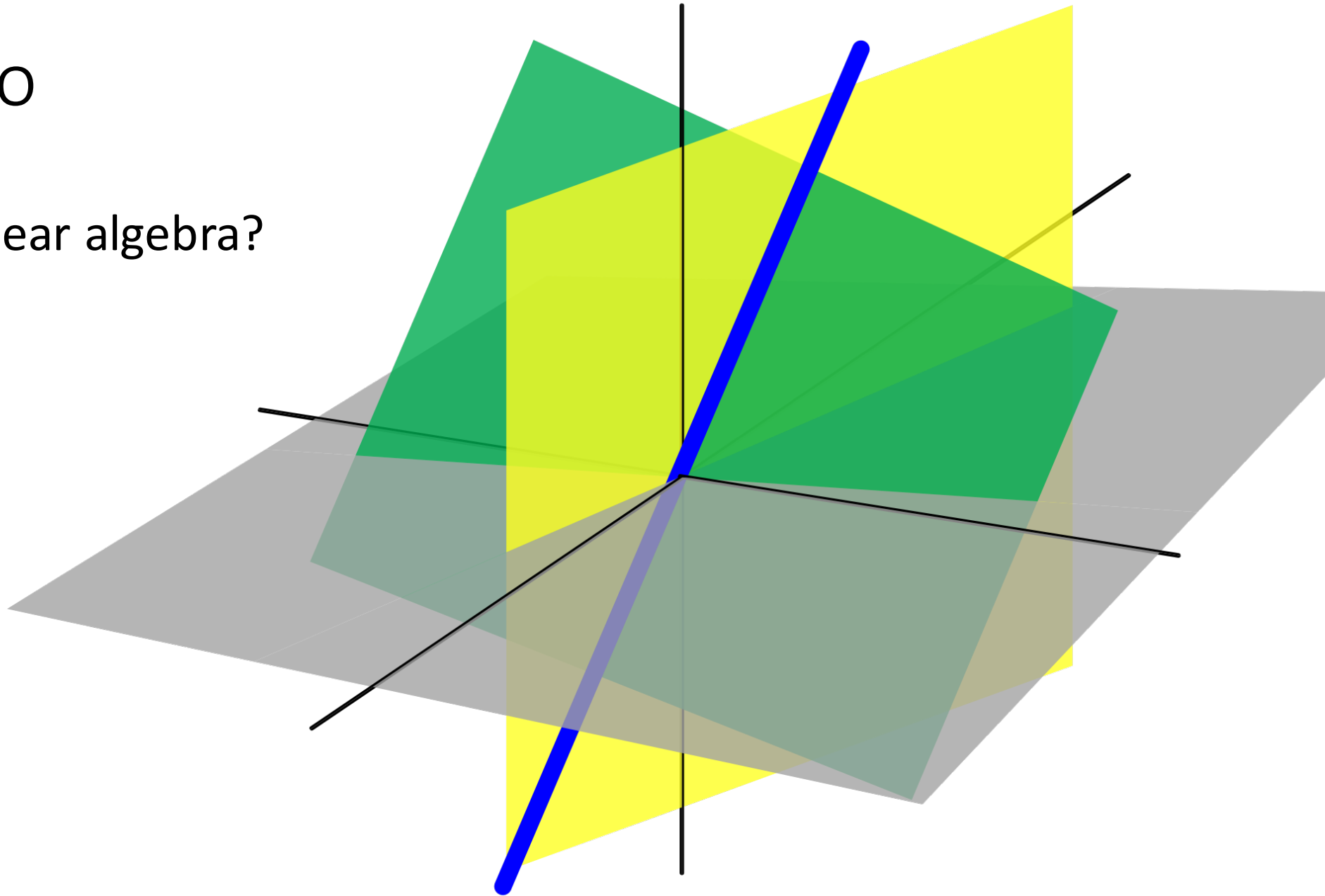
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Outline

- Linear functions

Here we go

- Remember, linear algebra?



More examples:

- Remem



Linear algebra catch-up

- Decartes to the rescue!

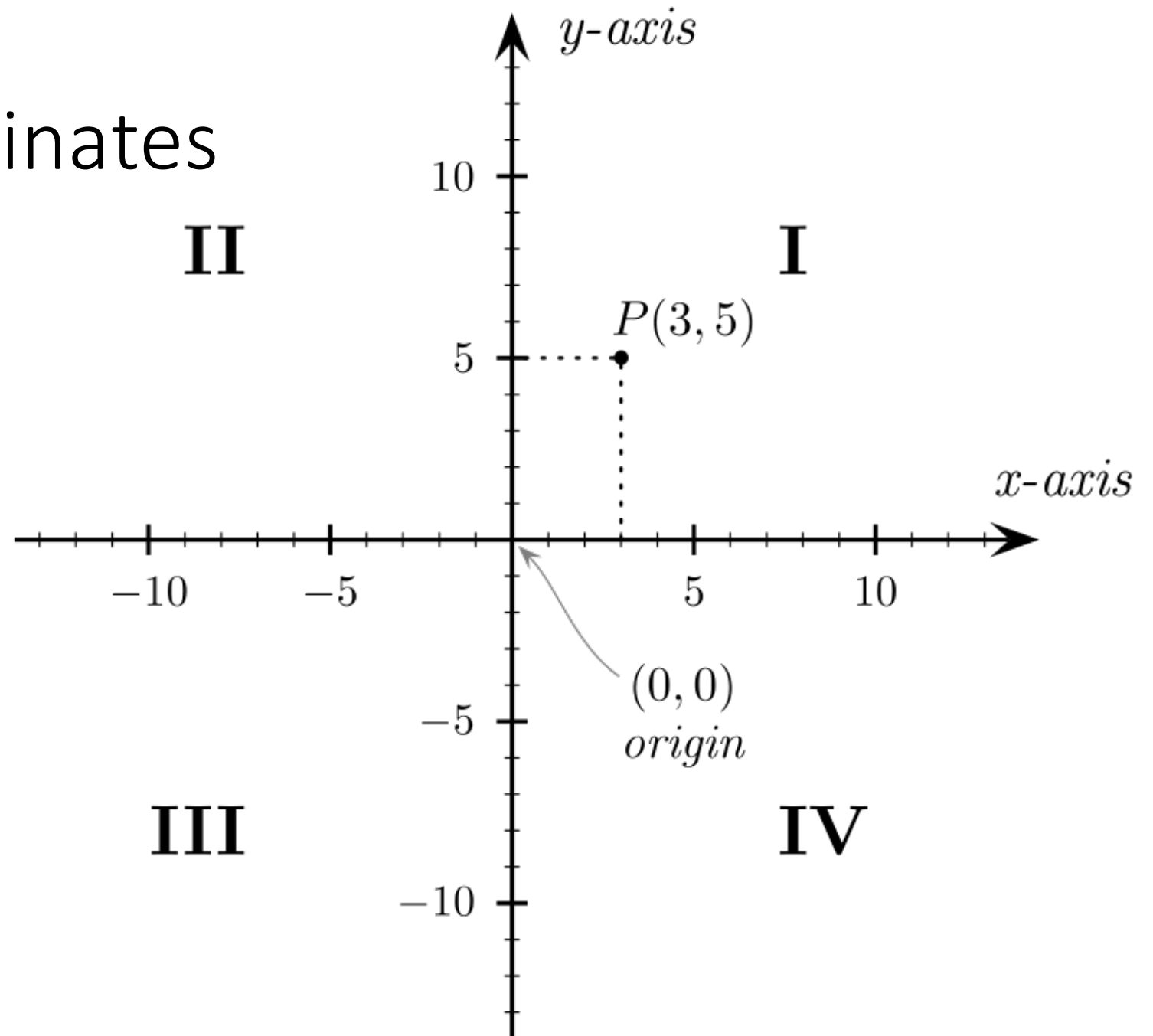


Cartesian coordinates

Can describe any point with coordinates x,y

P (3, 5)

Conventions:
mention x first.
 x is horizontal axis.
 y is vertical axis



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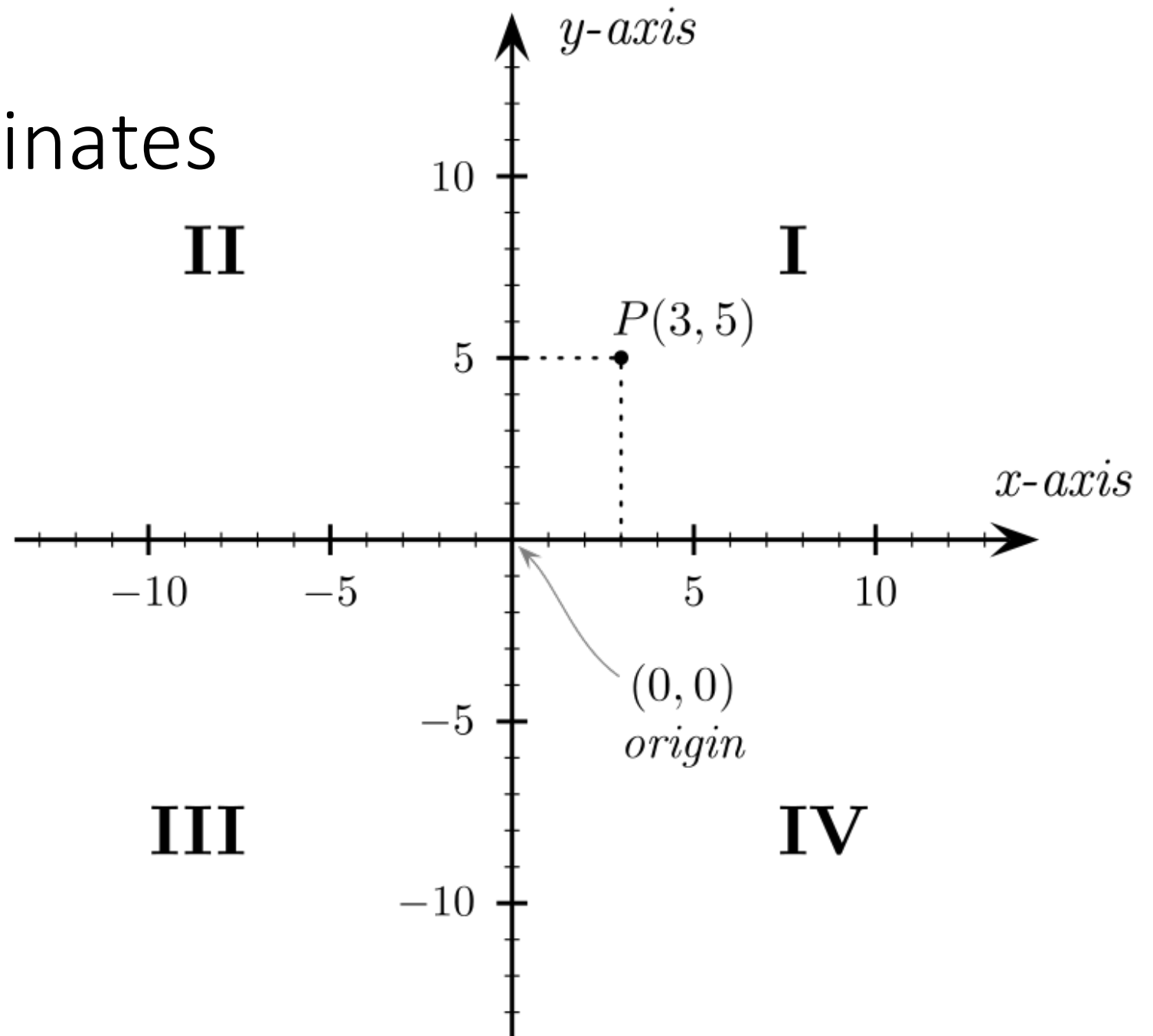
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Statistical conventions

Y is response variable

X is explanatory variable



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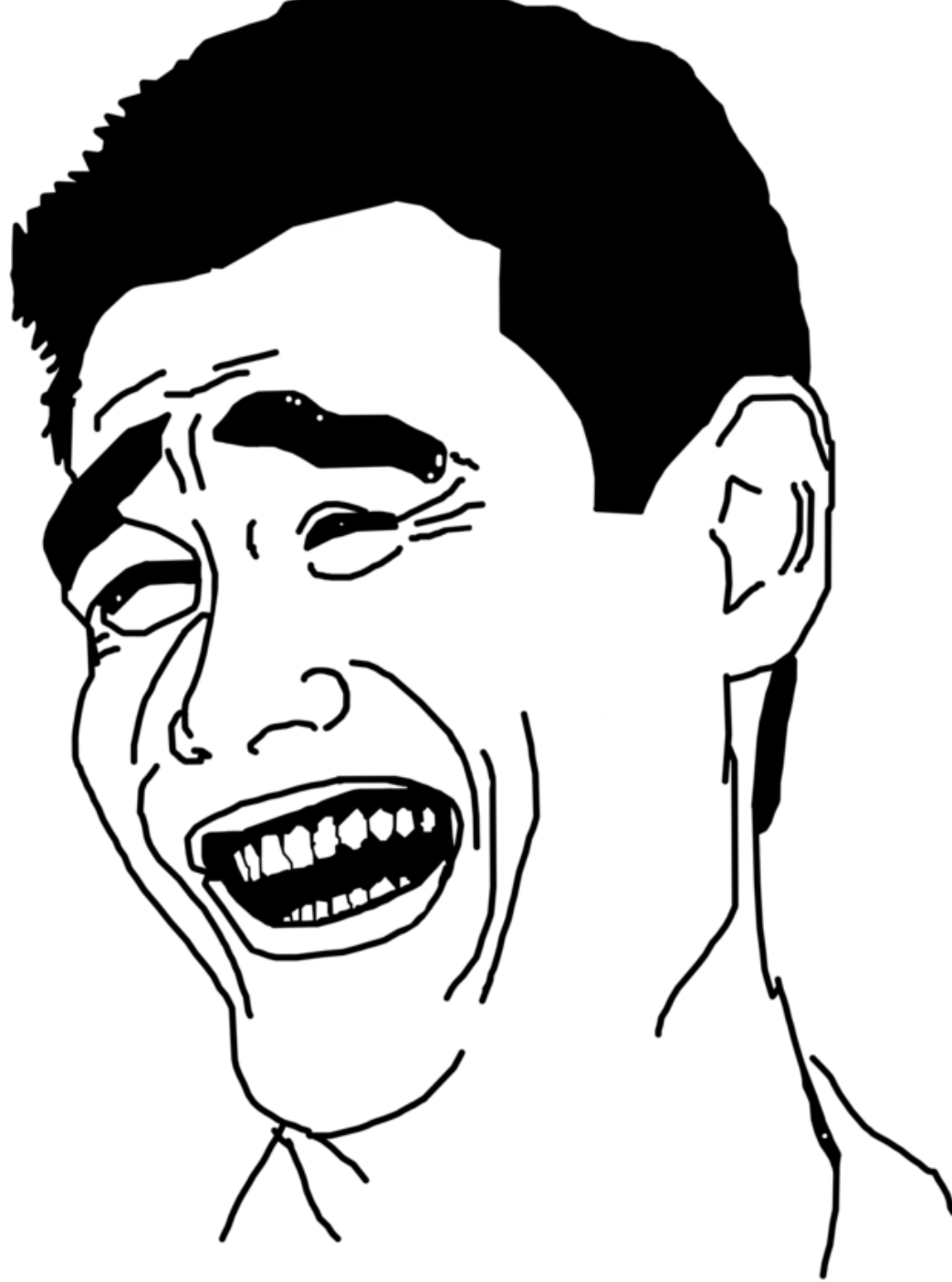
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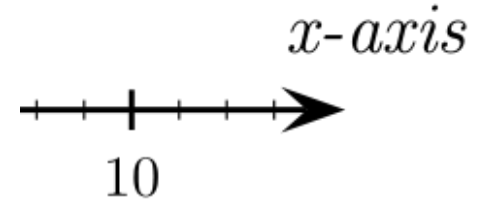
Statistical conventions

Y is response variable

X is explanatory variable



I



IV

Explanatory vs response variable

- Causality
 - Bigger sparrows are heavier
 - → Mass is response
 - → Size is explanatory
 - Male sparrows are heavier
 - → Mass is response
 - → Sex is explanatory
 - Food-rich areas have more animals
 - → Food abundance is response
 - → Animal density is explanatory



Explanatory vs response variable

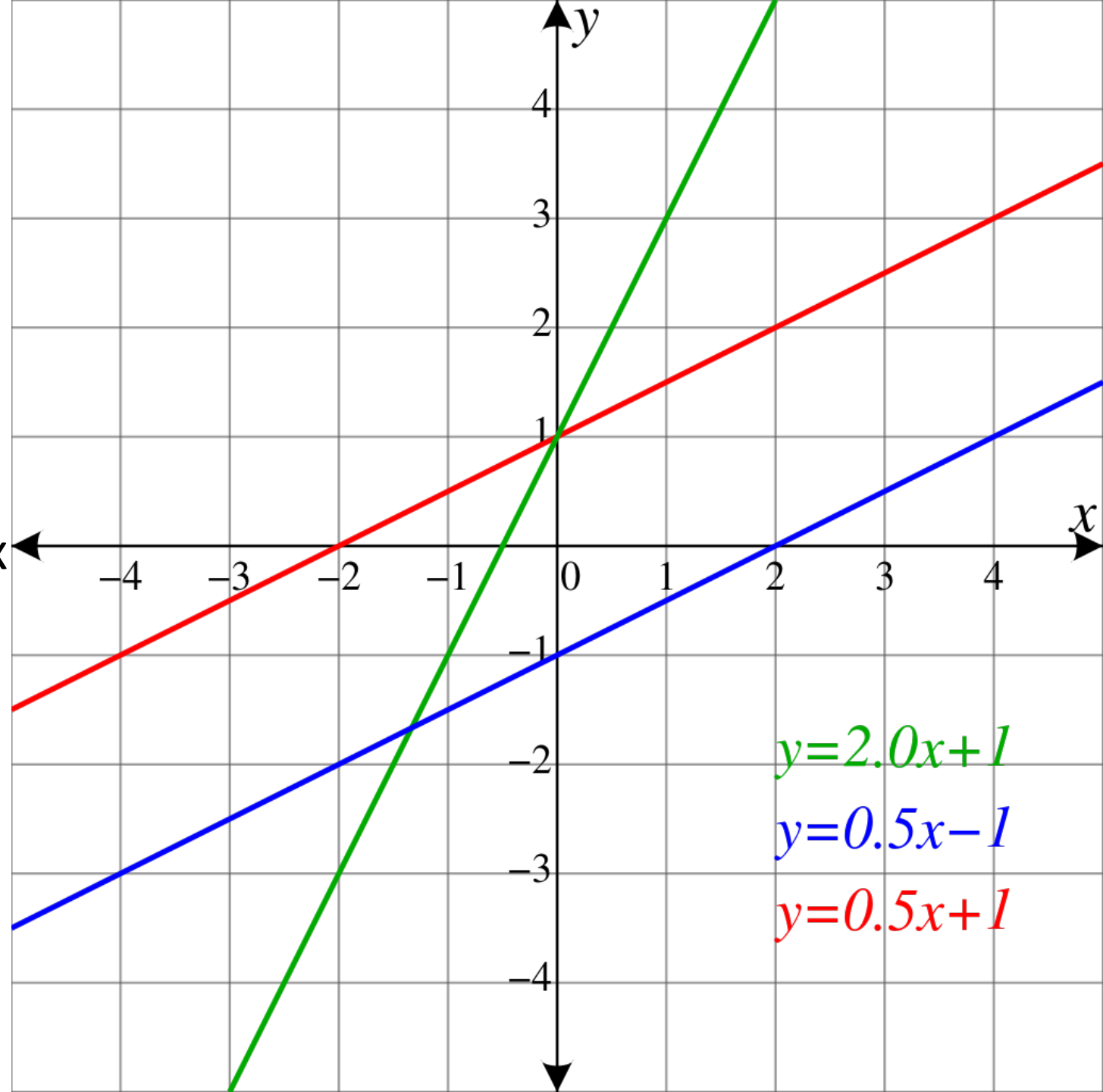
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- Sometimes unclear:
- Association between wing length and tarsus
- Animal and plant diversity
- ...

Explanatory vs response variable

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 - Bigger sparrows are heavier
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- Sometimes unclear:
- Association between wing length and tarsus
- Animal and plant diversity
- ...
- **When analysing data ALWAYS get it straight what is response and what is explanatory!**

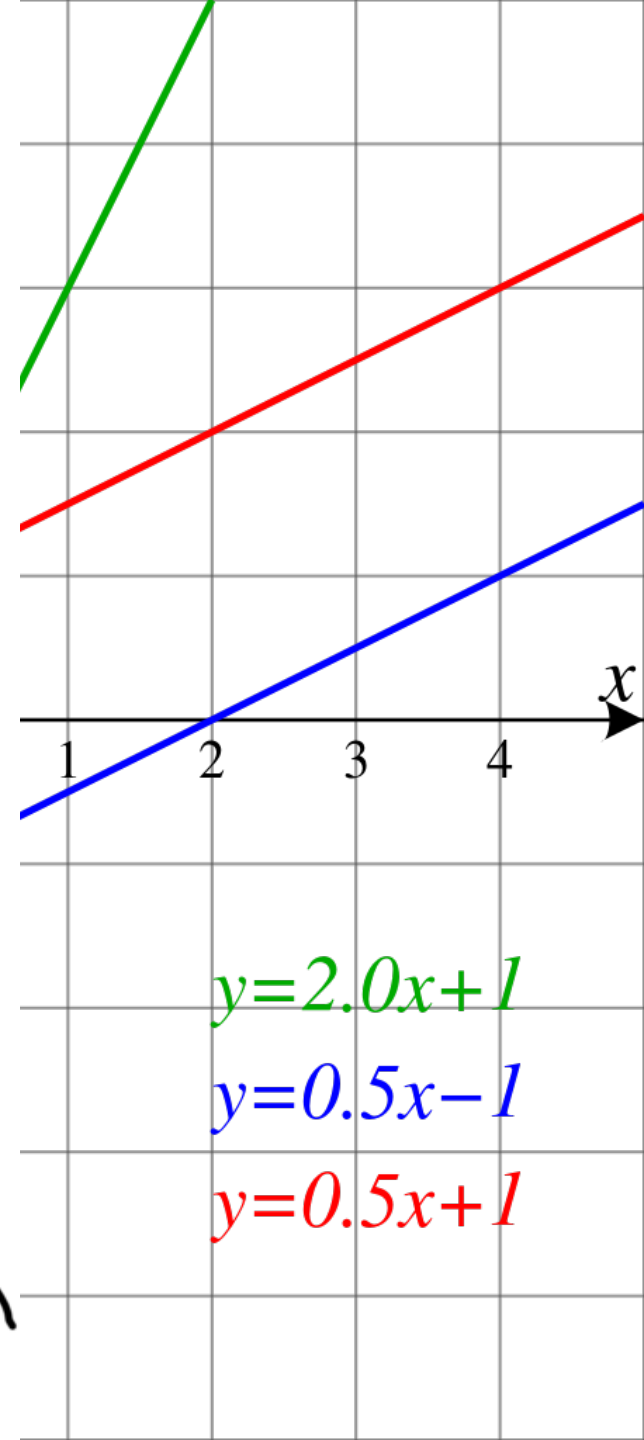
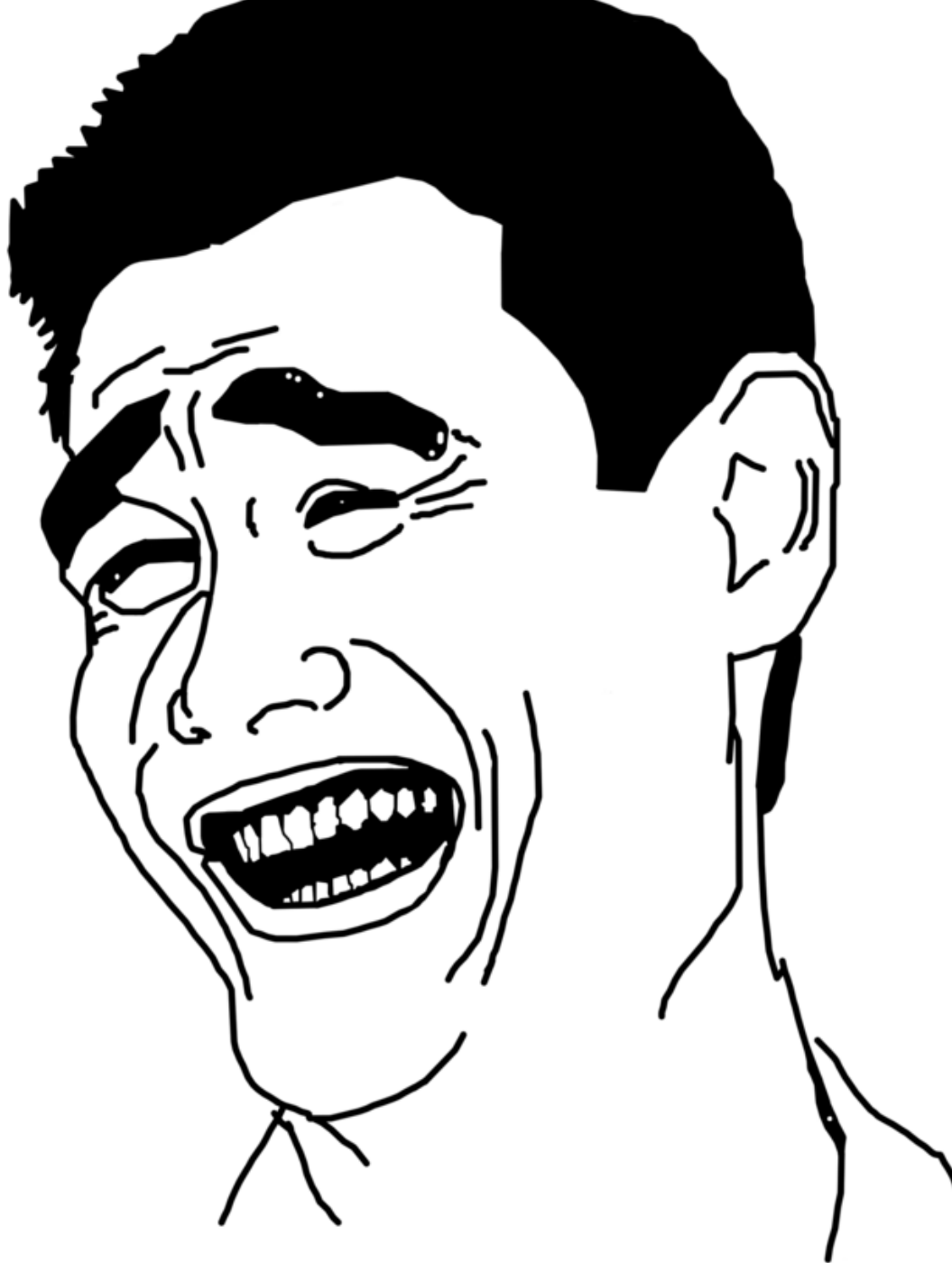
Linear functions

- Used to describe a line in a cartesian coordinate system
- $y = m x + b$
- y coordinate dependent on x
- m = slope
- b = intercept



Linear function

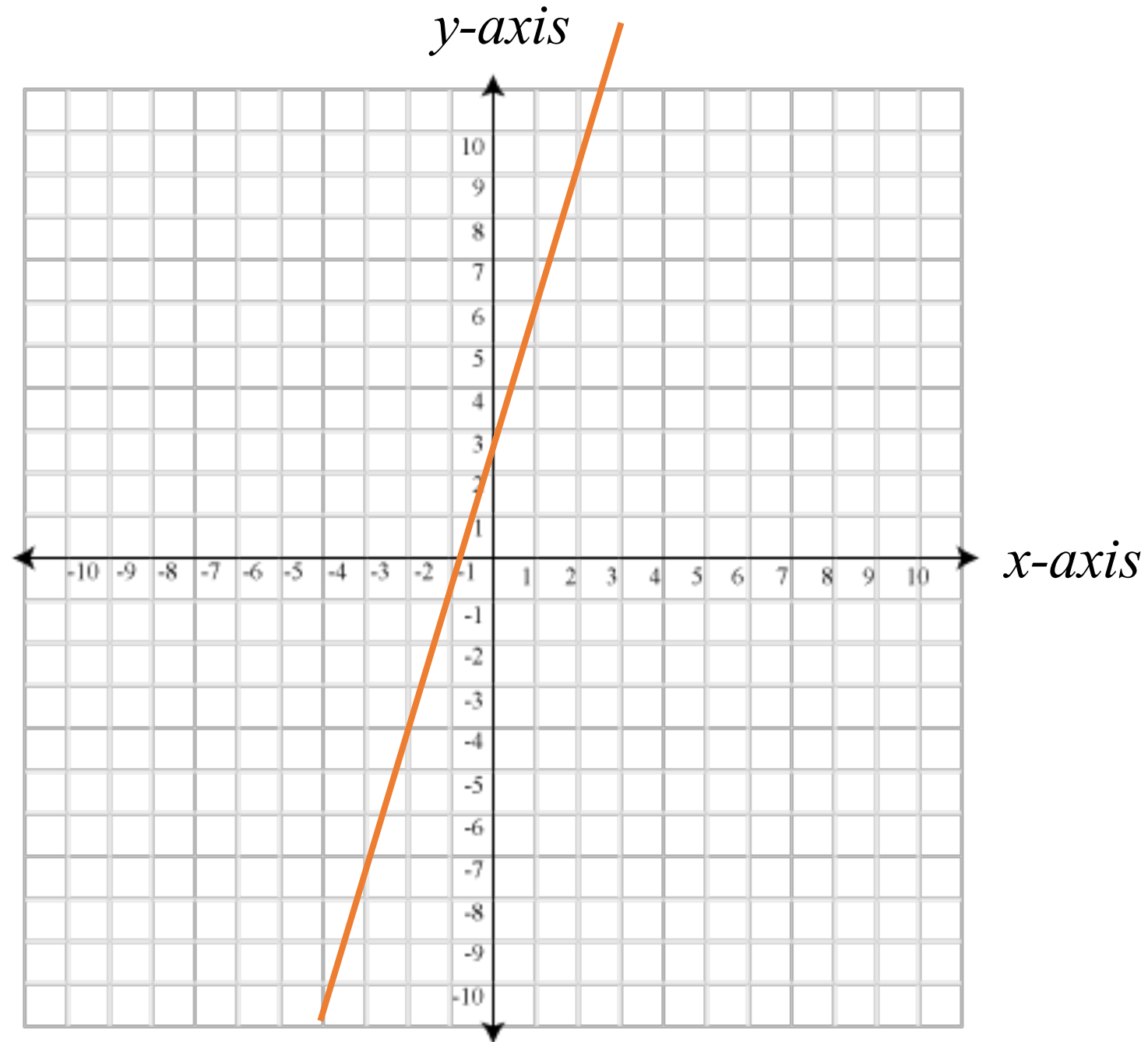
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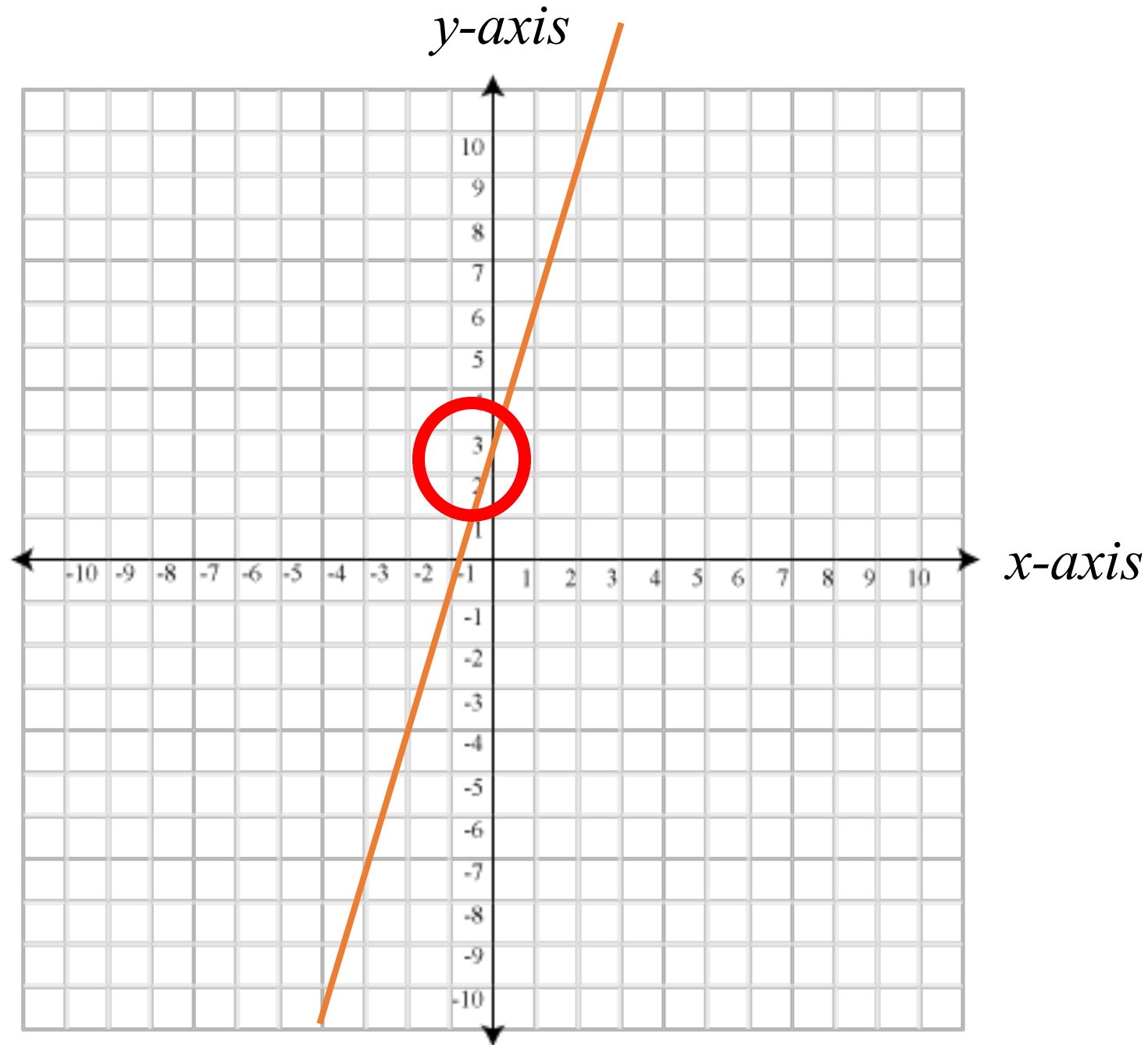
- Find where line crosses y:



Linear functions

$$y = m x + b$$

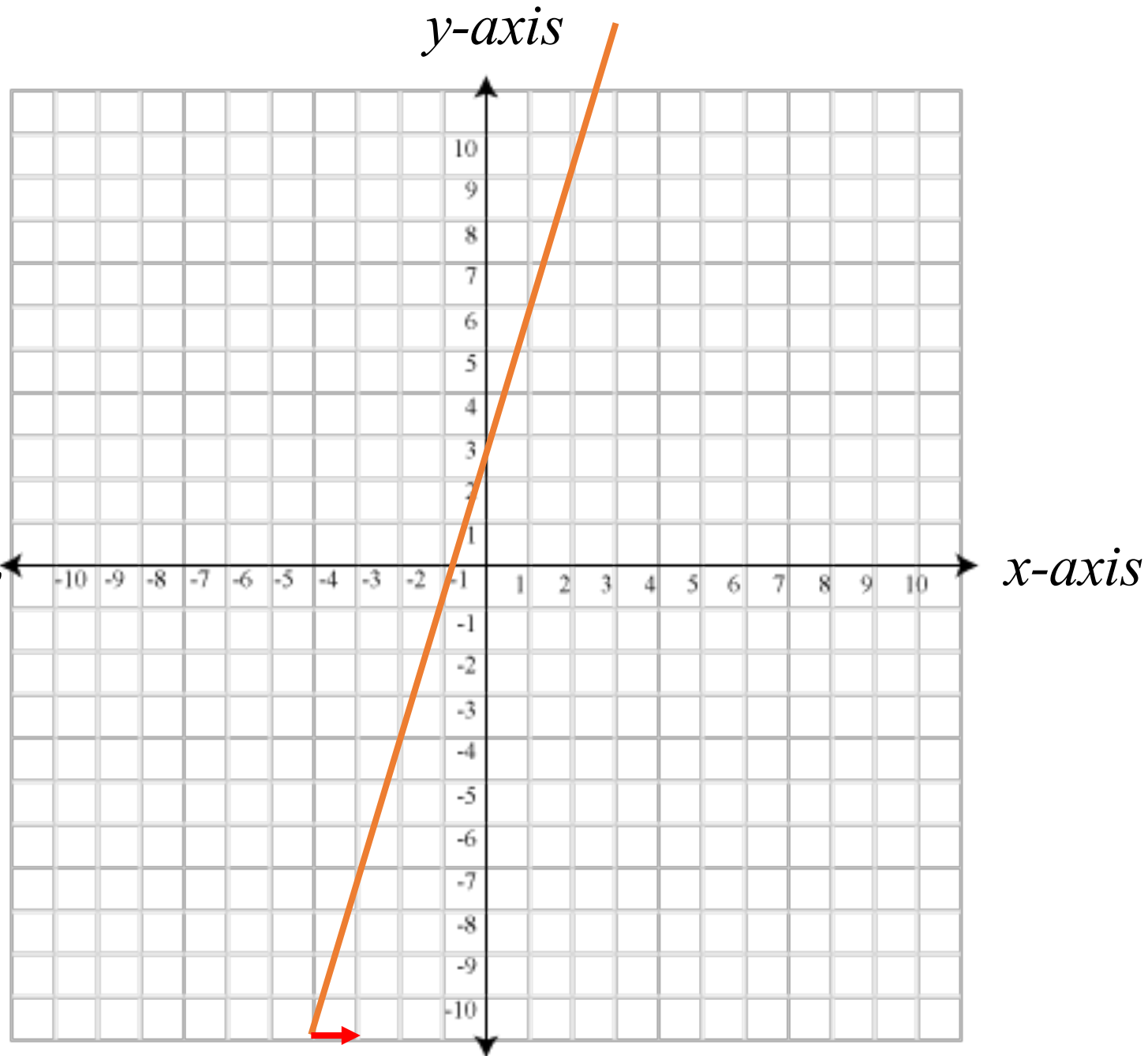
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- 2.5. That's b!



Linear functions

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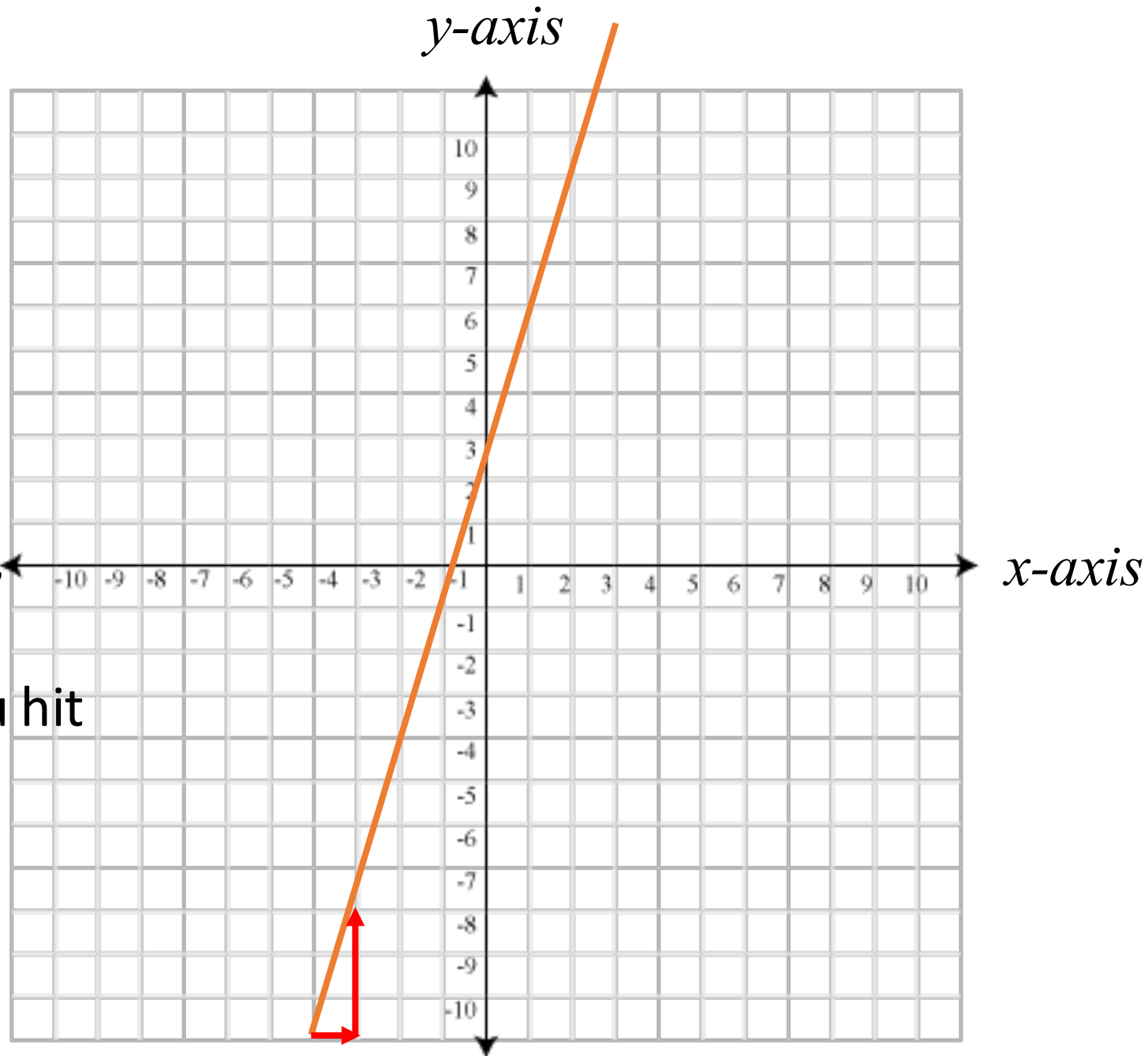
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- Go 1 x to the left of the line, anywhere.



Linear functions

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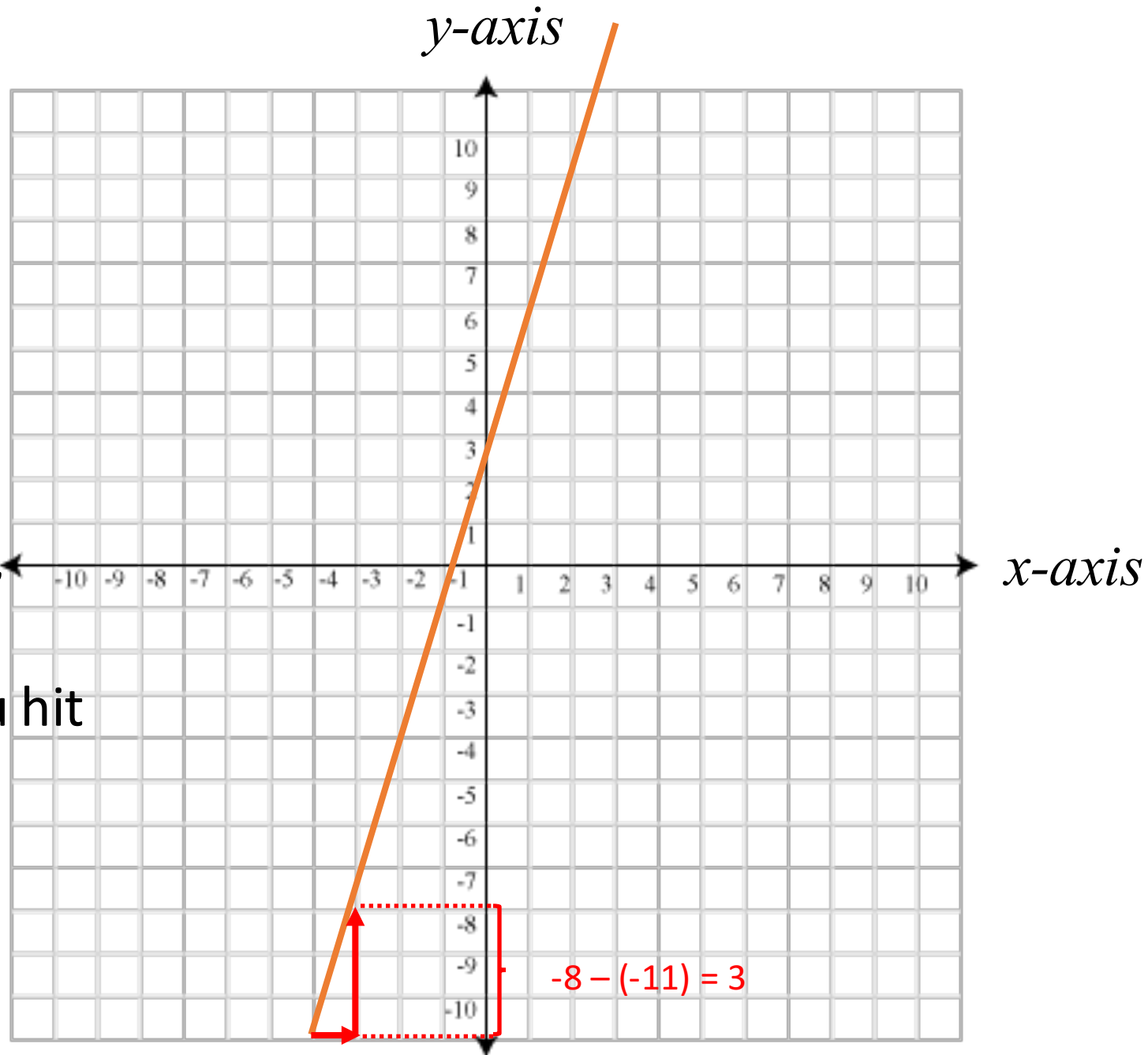
- Find where line crosses y :
- 2.5. That's b !
- Go 1 x to the left of the line,
anywhere.
- Go *up*, and count y until you hit
the line again:
- 3. That's m !



Linear functions

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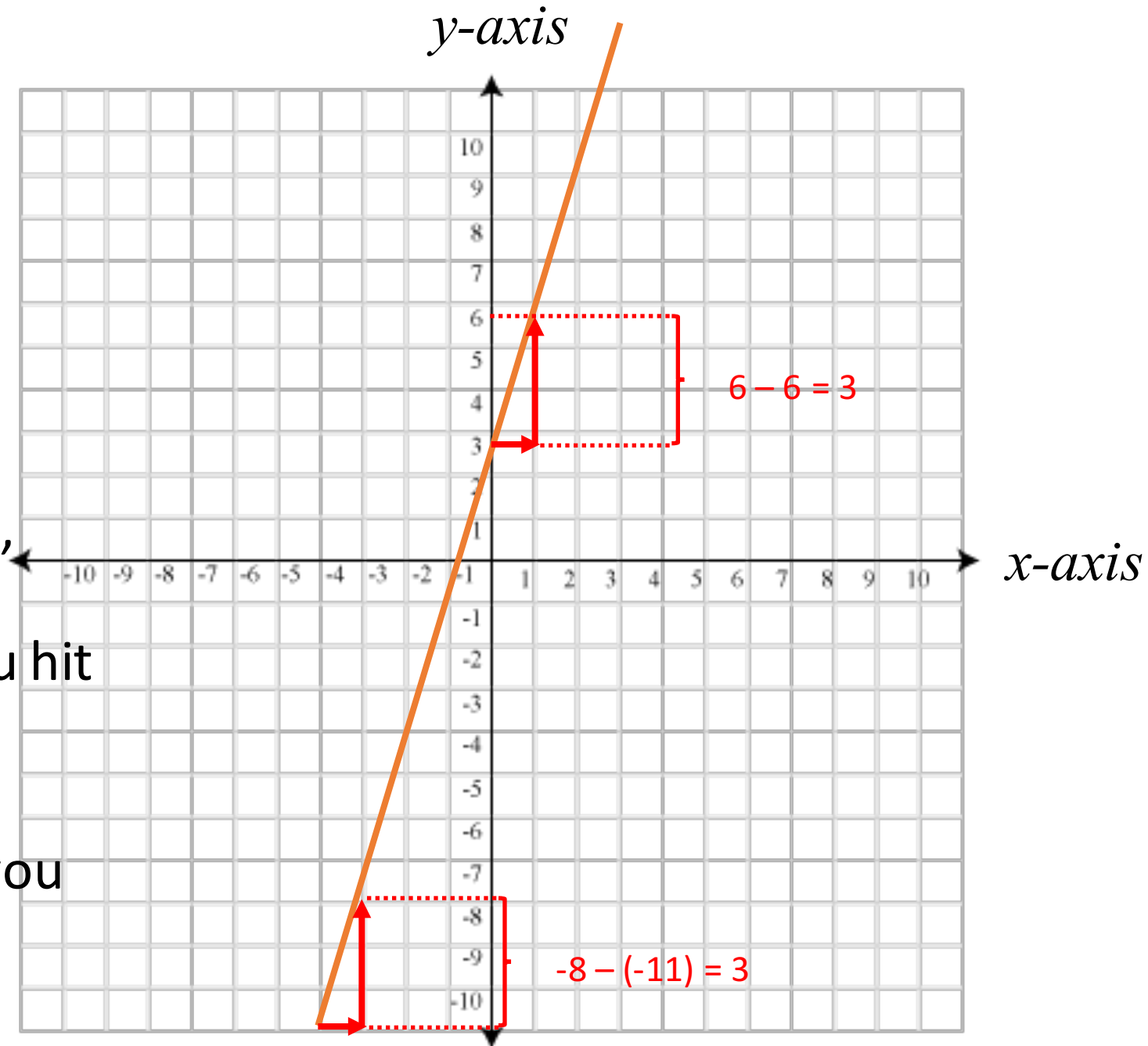
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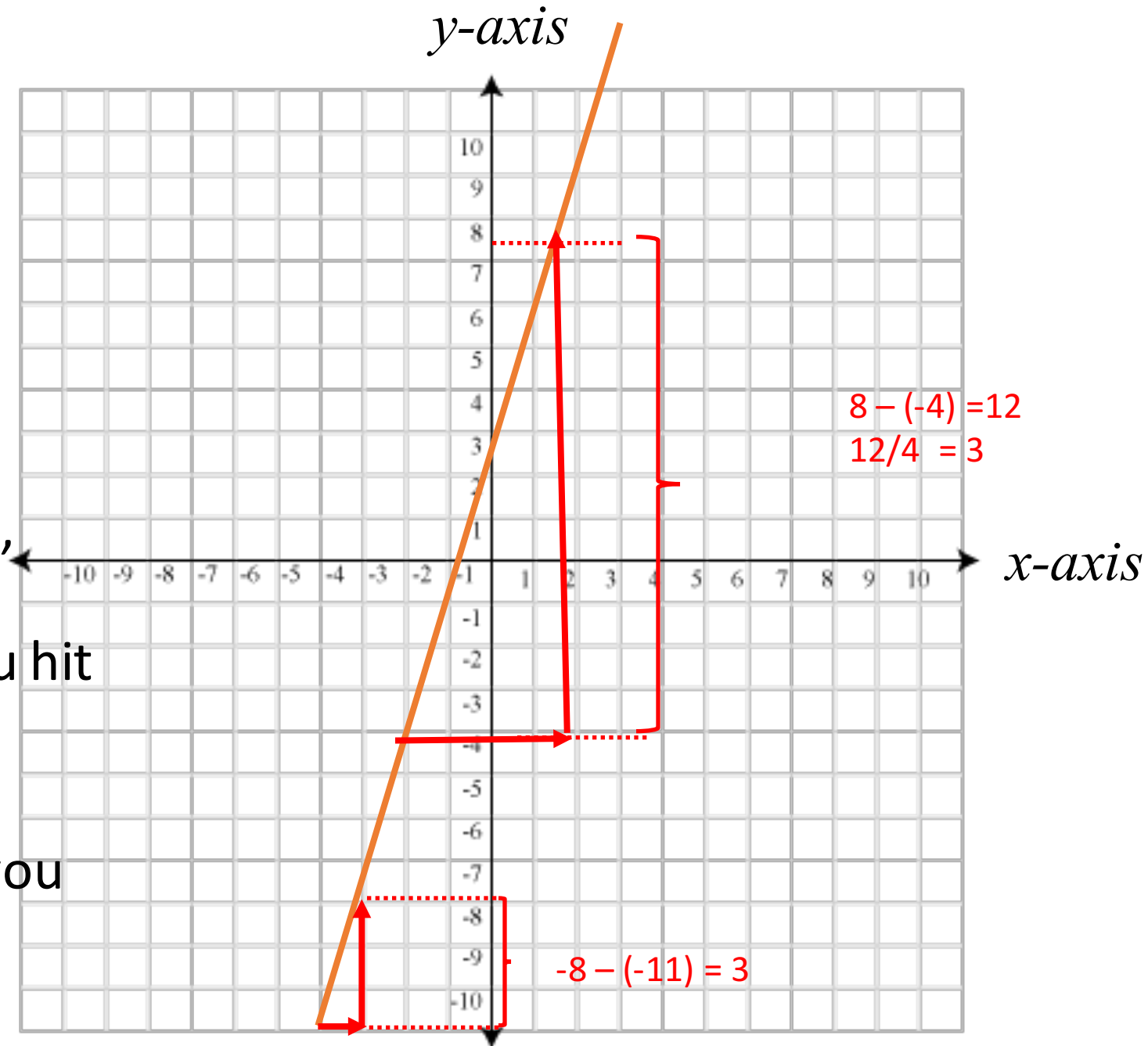
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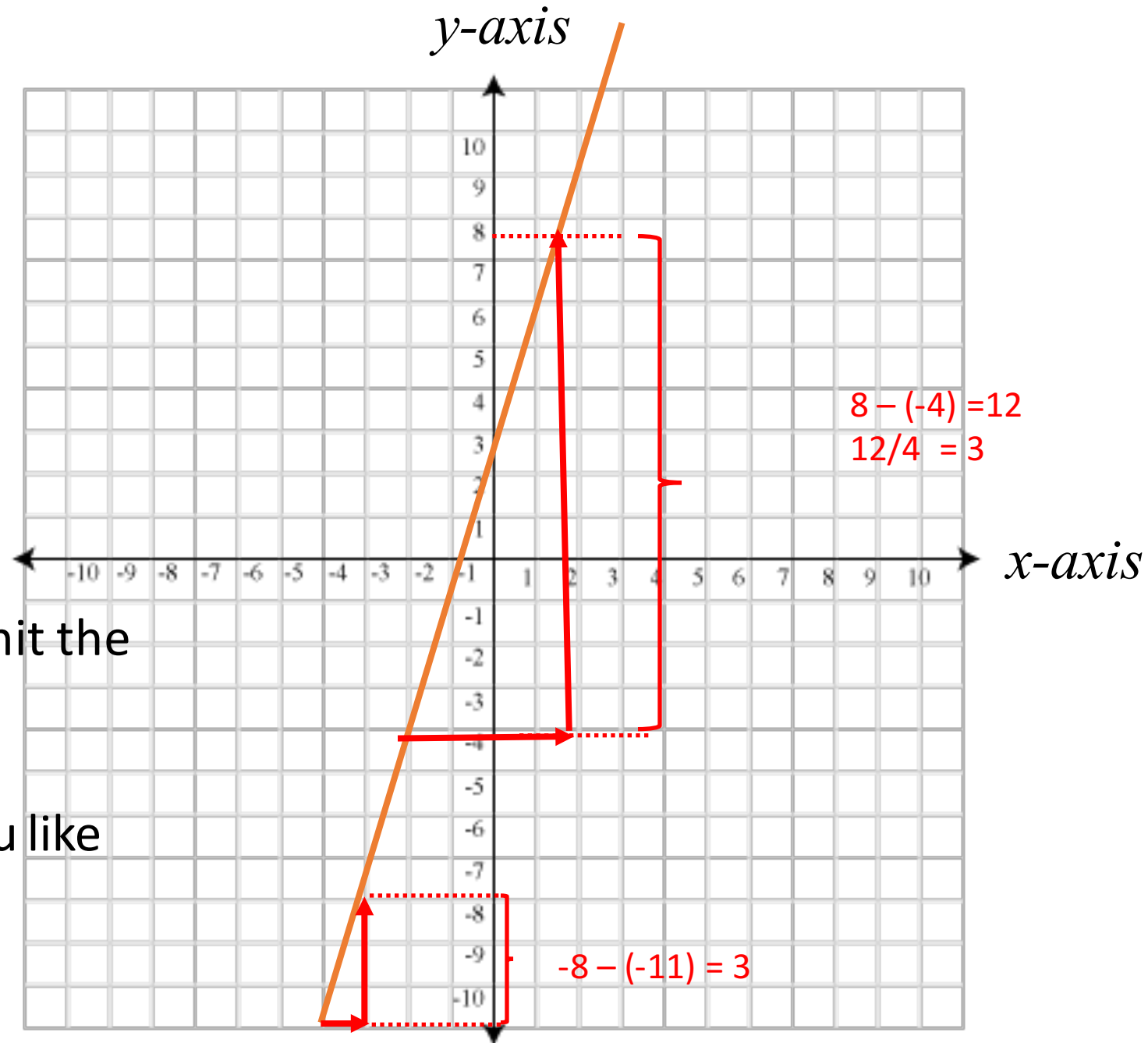
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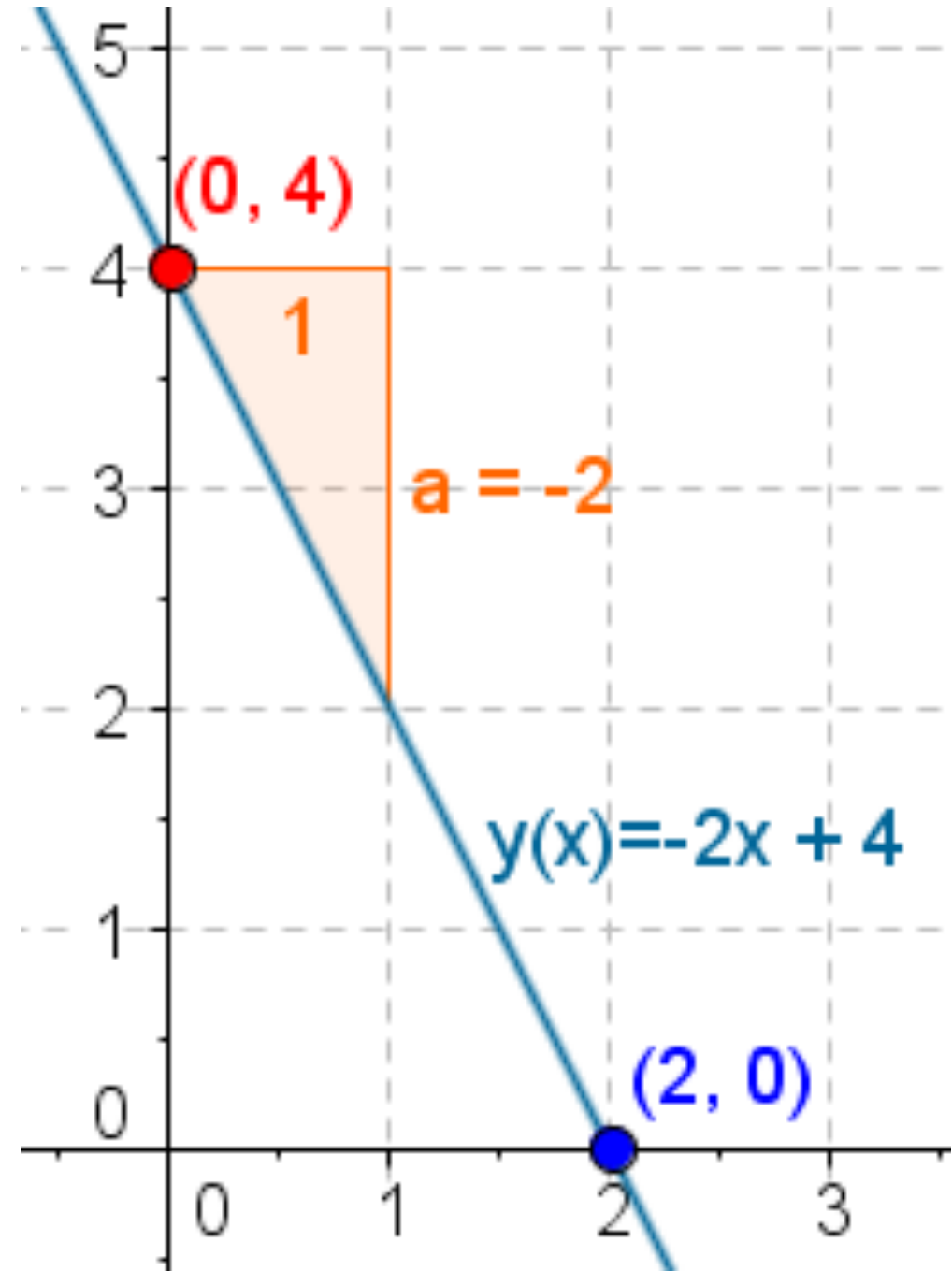
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- You can do that *anywhere* you like
- $Y = 3x + 2.5$



Linear functions

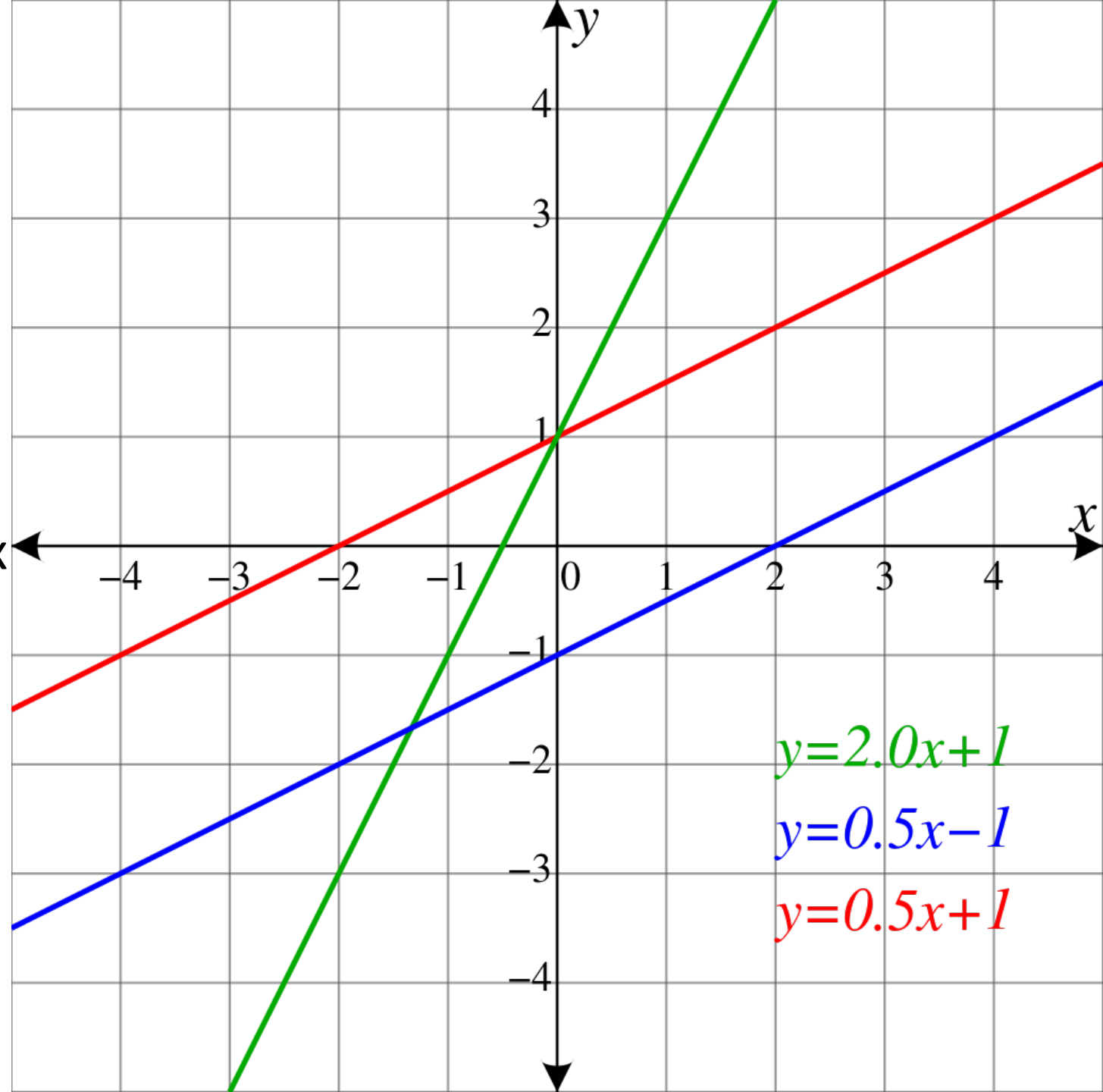
$$y = m x + b$$

- Sometimes, for slope, you have to go down instead of up.
- The slope is then negative.



Linear functions

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Do it now!

- How many df's for a line anywhere ?
- Df for a line that goes through the origin $P(0,0)$?
- Df for a line with slope 1, and variable intercept?