Statistics with Spa  ows

Lecture 8

Julia Schroeder

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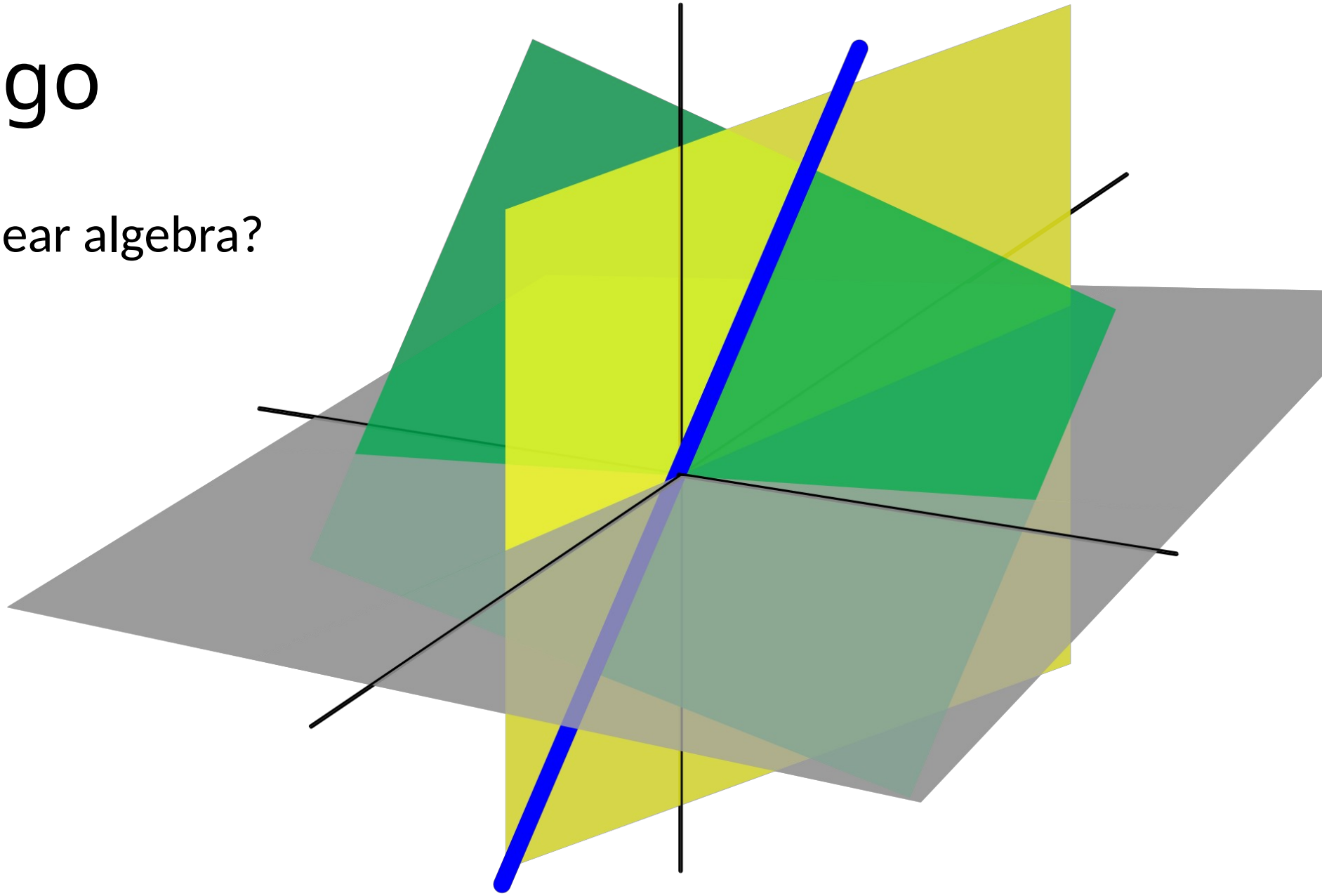
Outline

- Linear functions

Here we go

- Remember, linear algebra?



More examples:

- Remem

Linear algebra catch-u

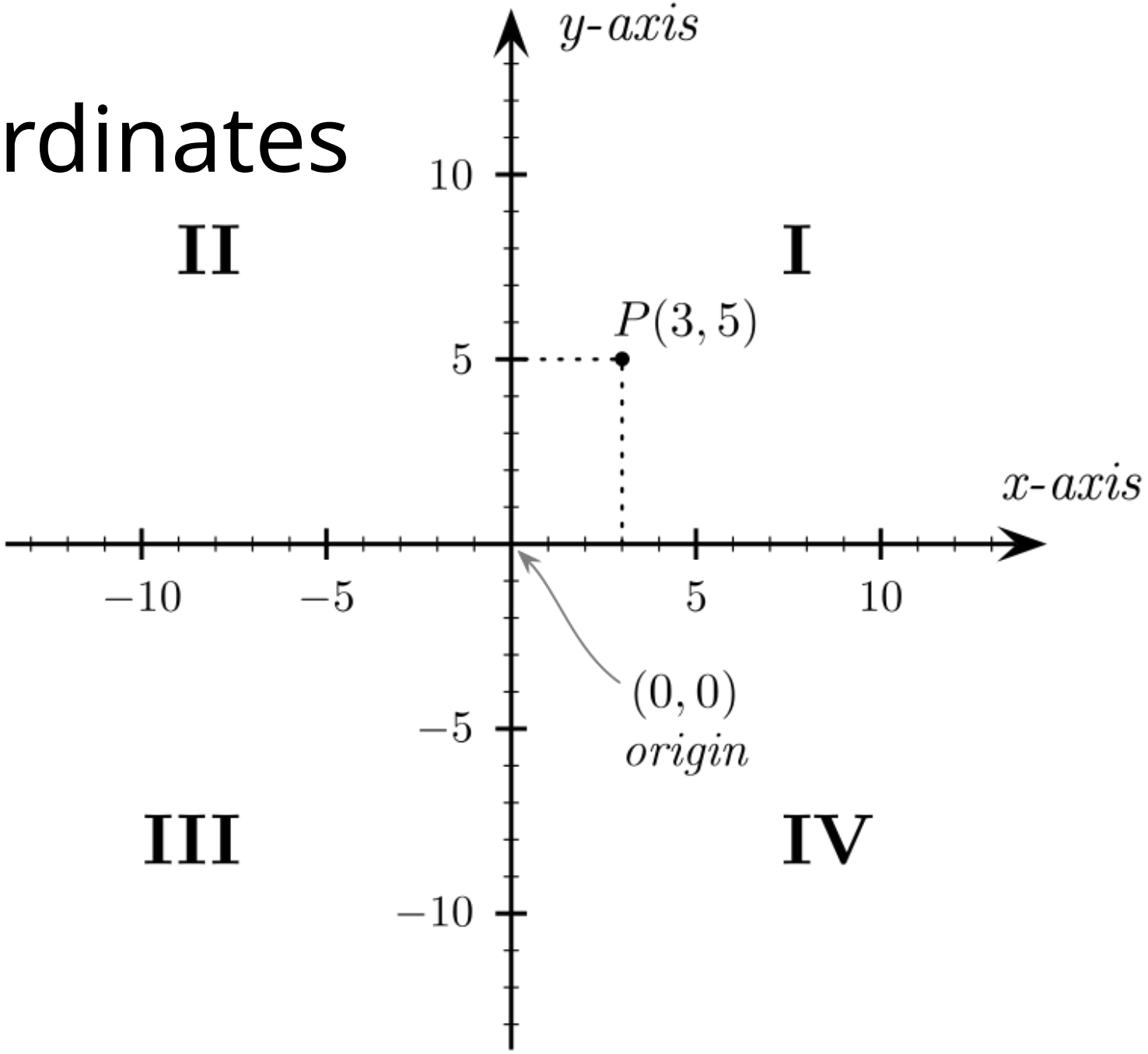
- Decartes to the rescue!

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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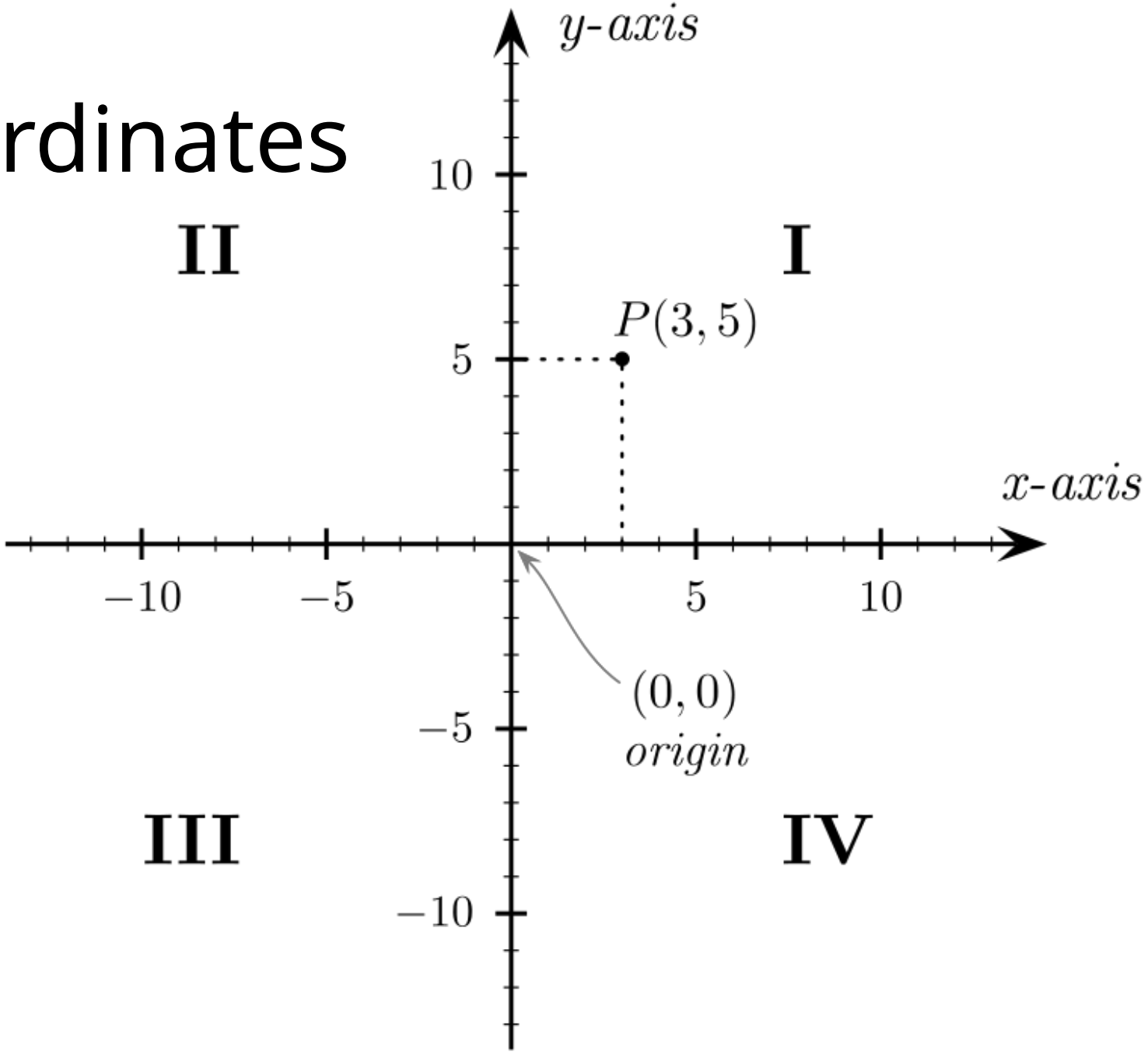
X is explanatory variable



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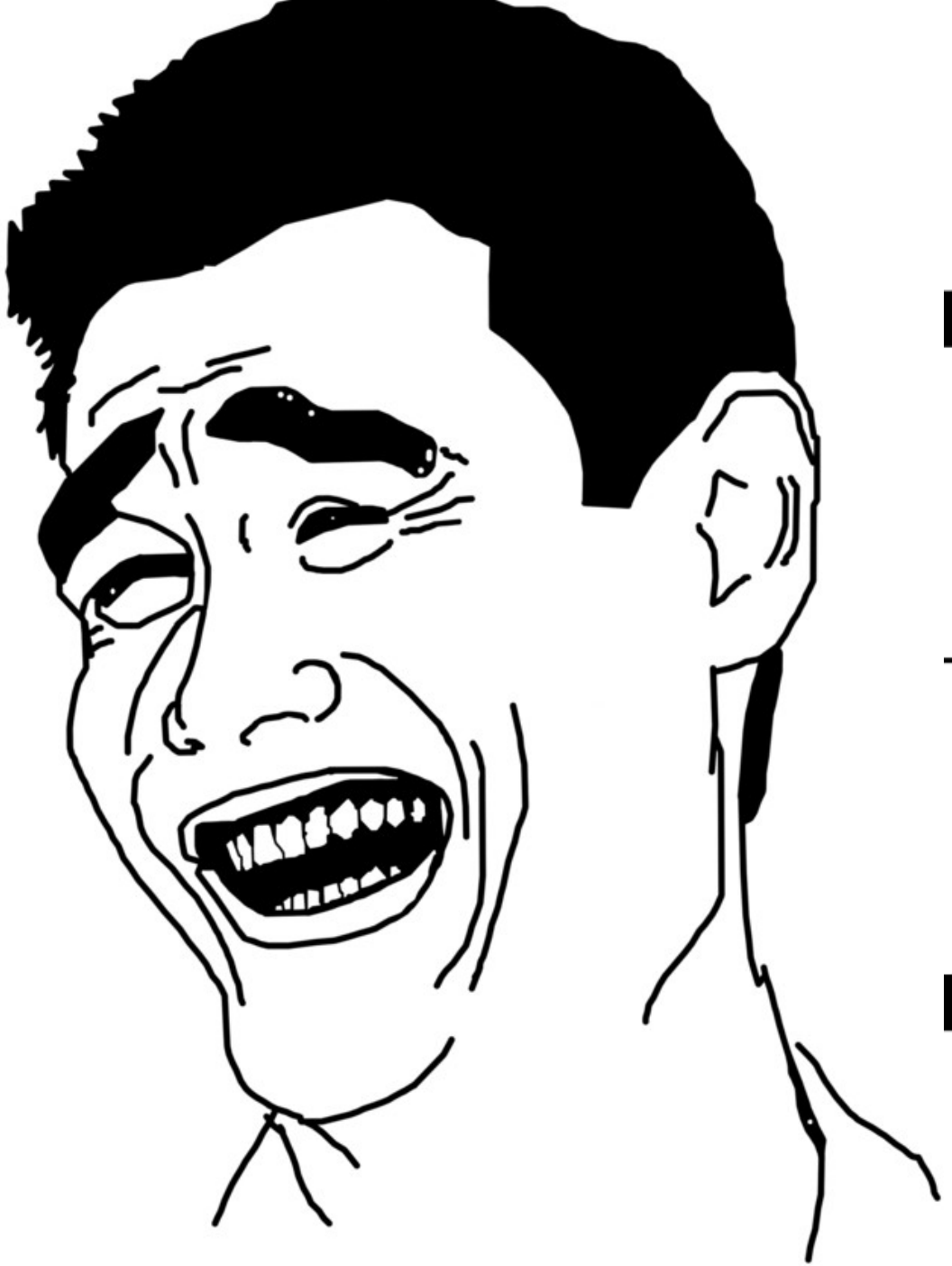

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$x\text{-}axis$

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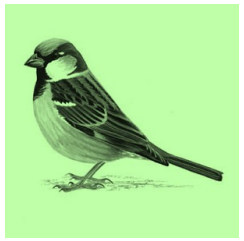
Explanatory vs response variable

- 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



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- Association between wing length and tarsus
- Animal and plant diversity
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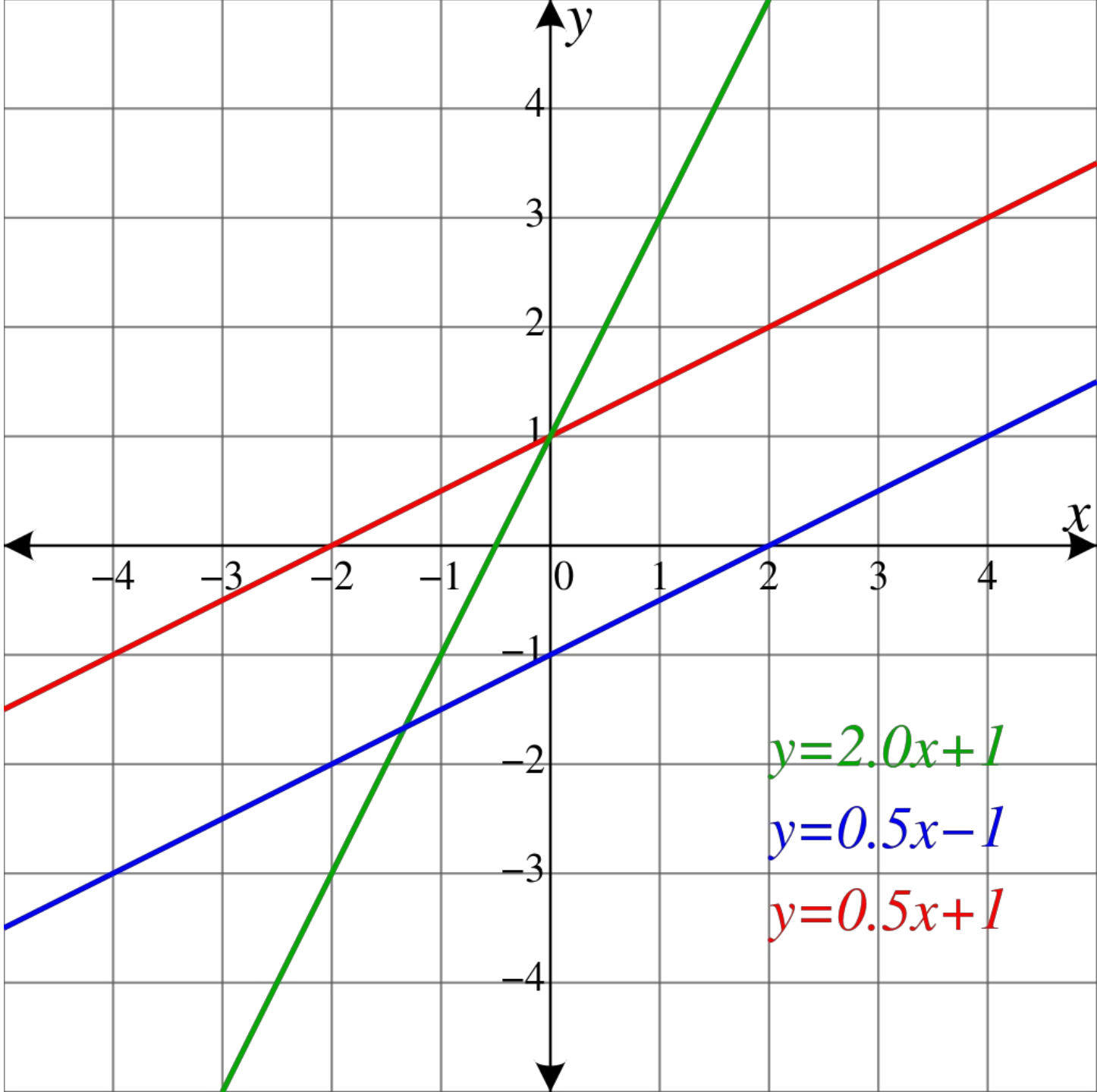
- **When analysing data ALWAYS get it straight what is response and what is explanatory!**

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



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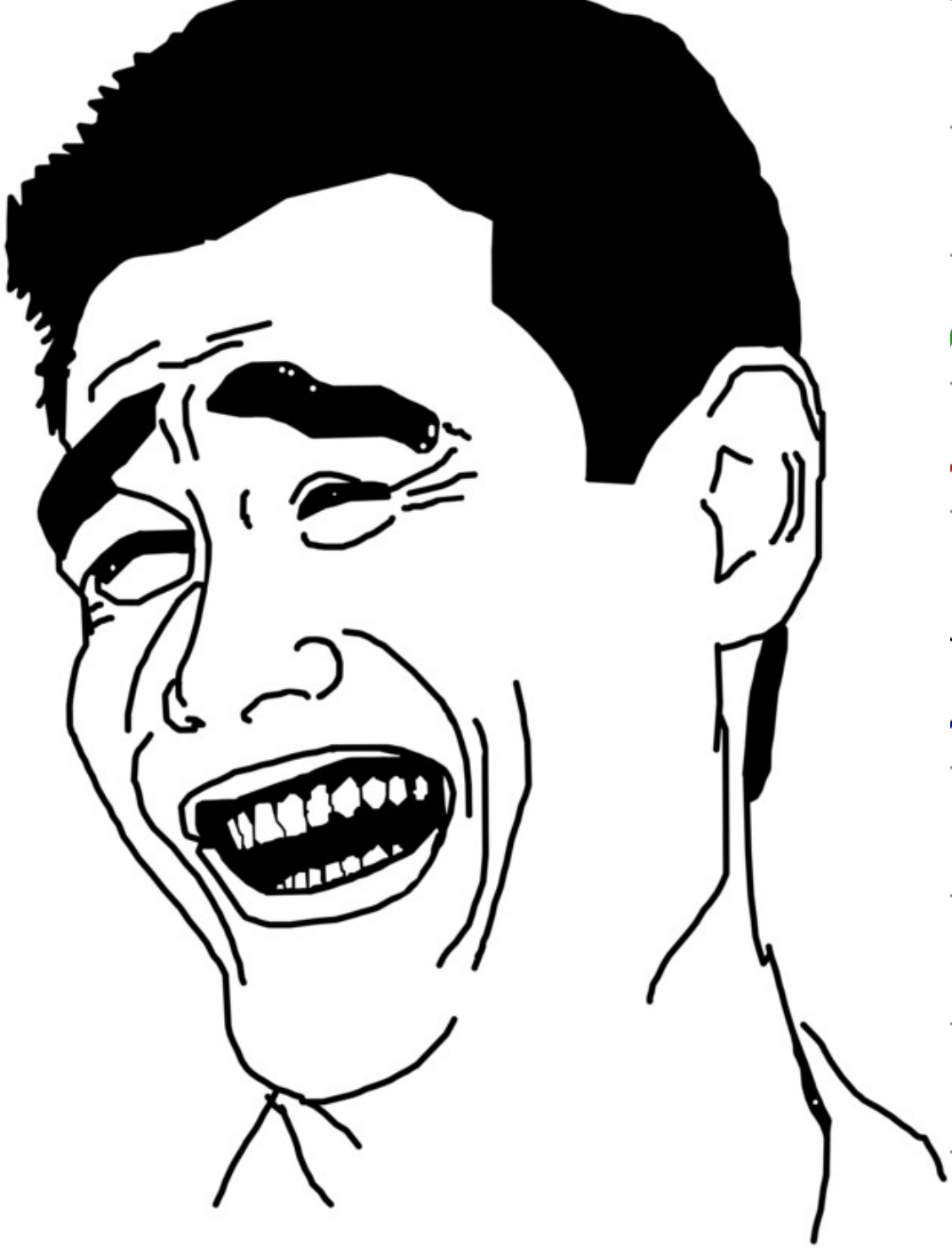
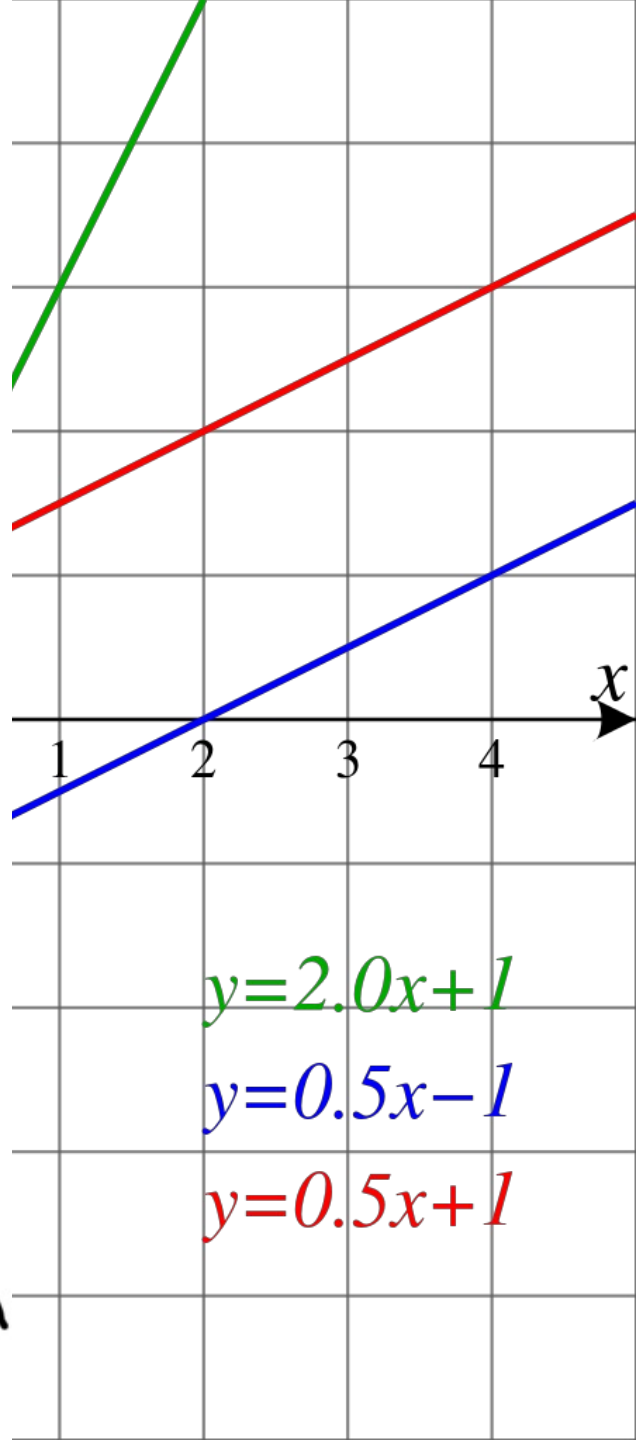
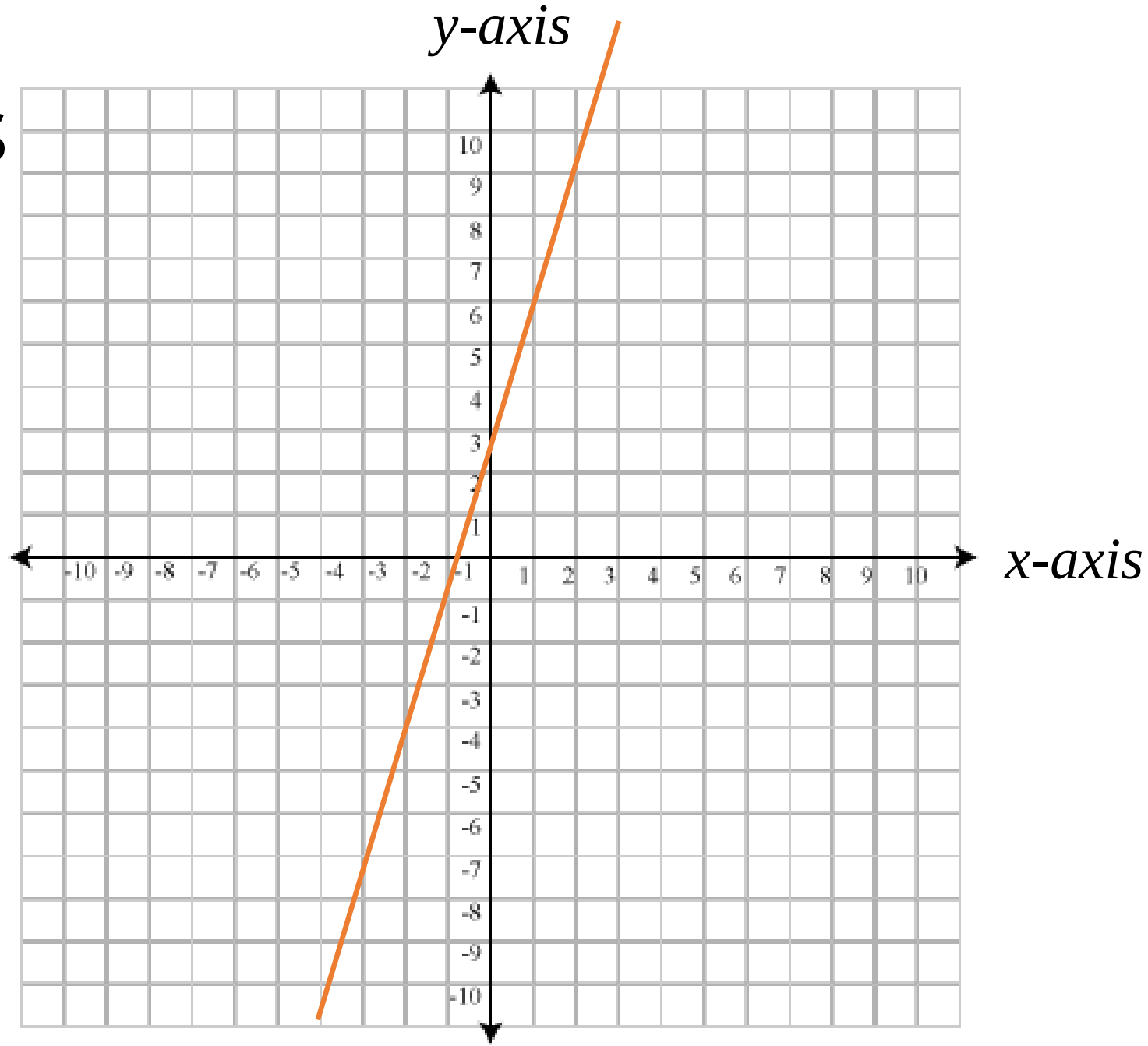




Linear functions

$y = m x + b$

- Find where line crosses y:



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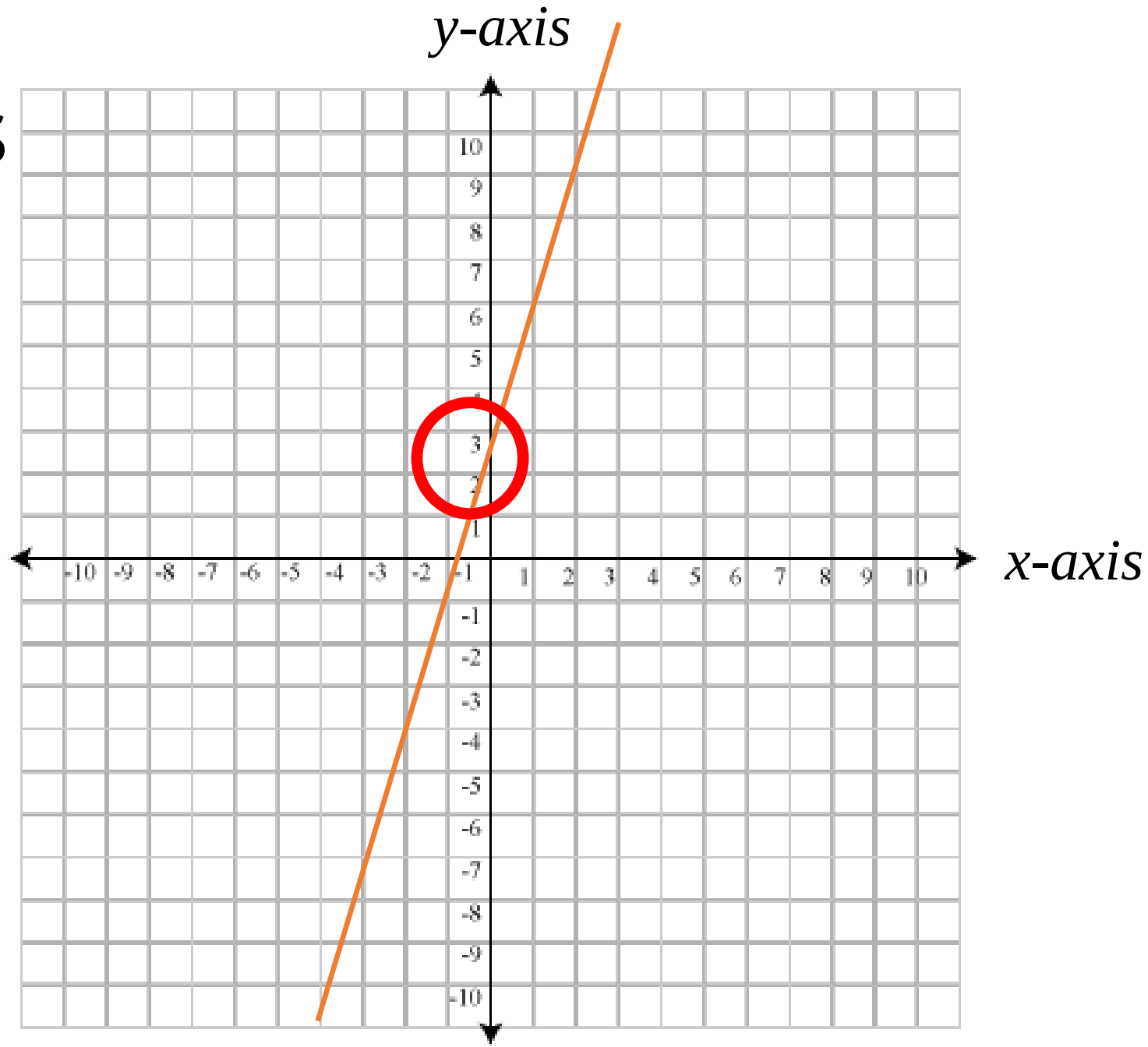
- 2.5. That's b!



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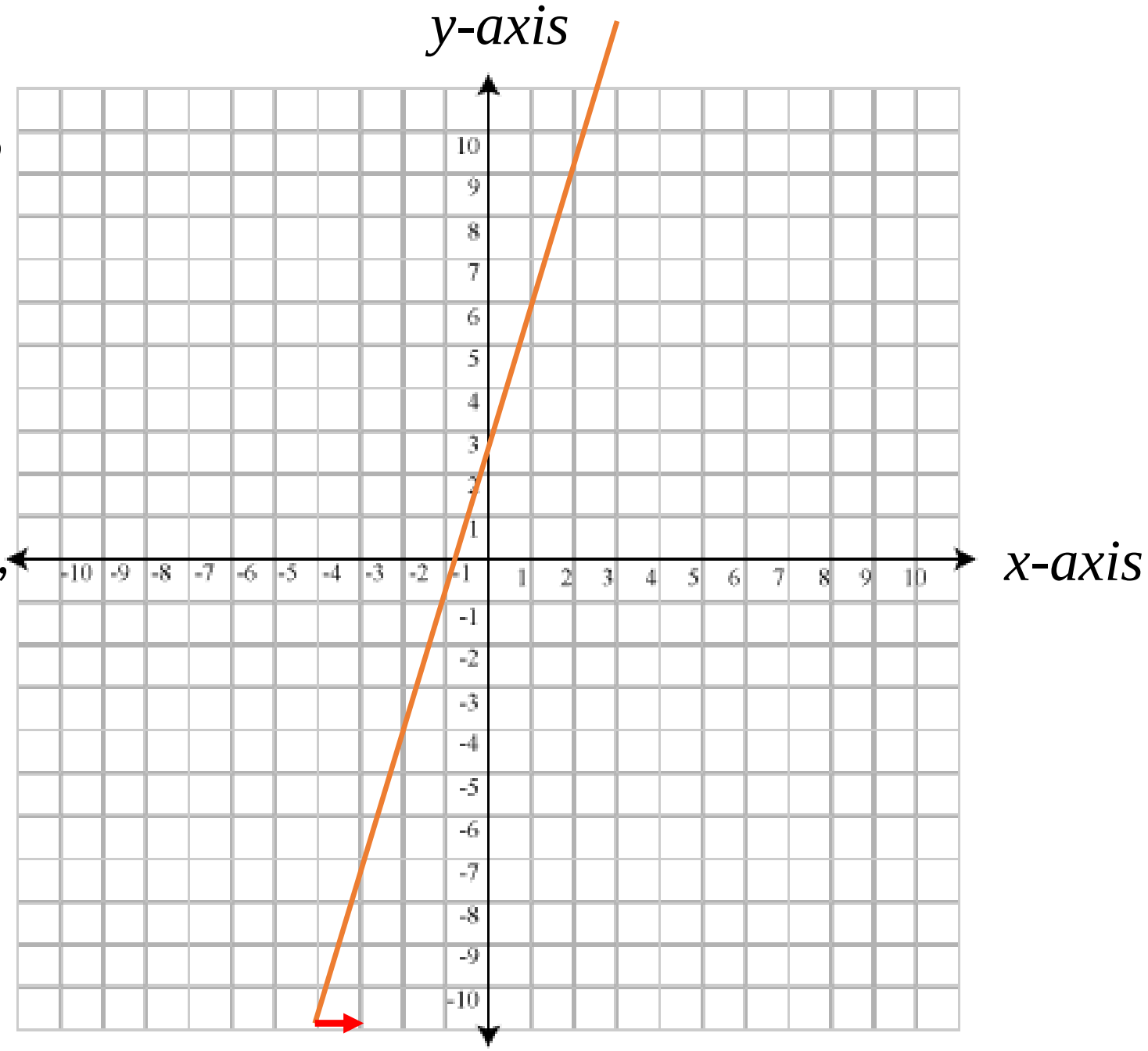

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- Go 1 x to the left of the line, anywhere.
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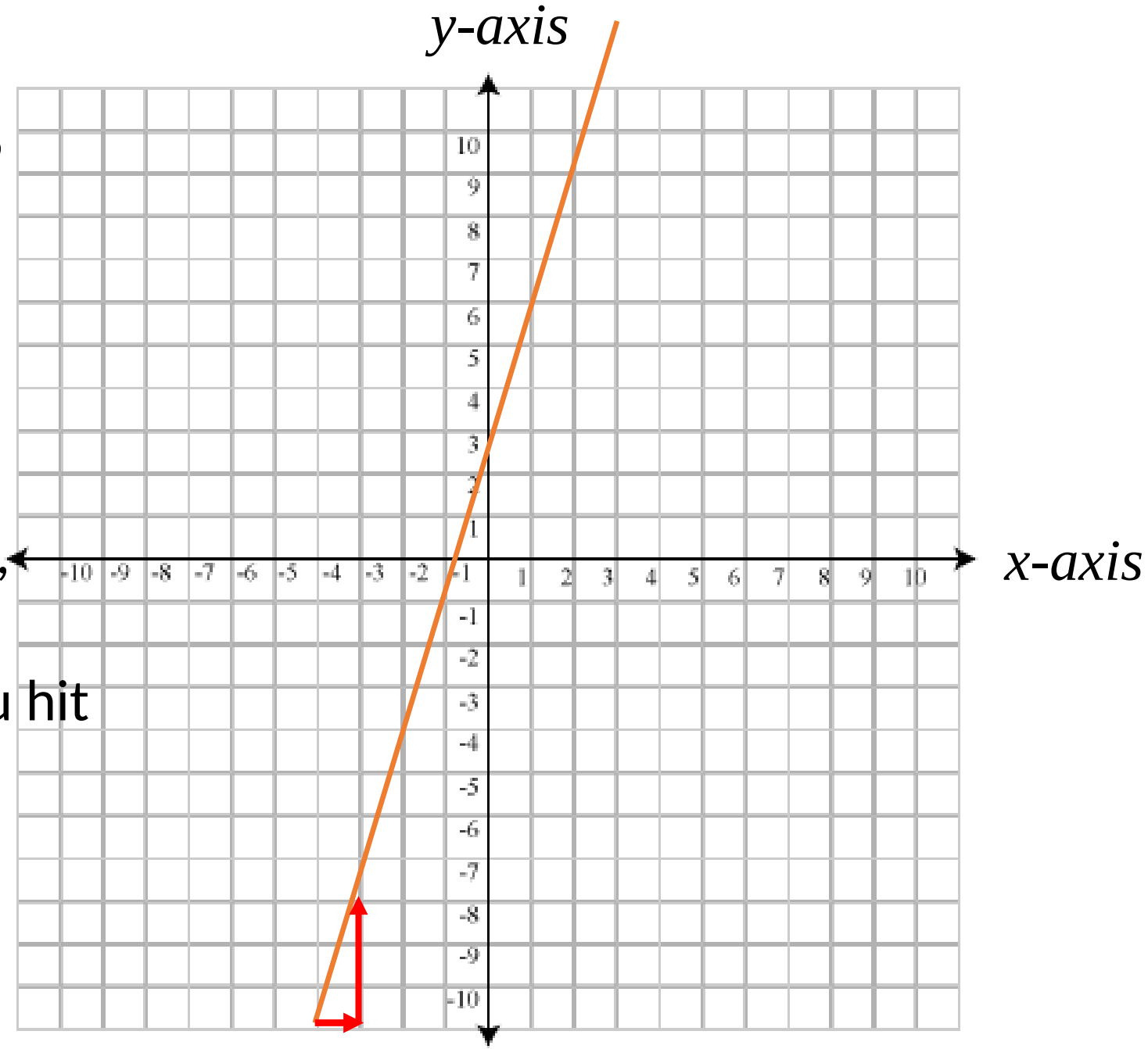
- 3. That's m!



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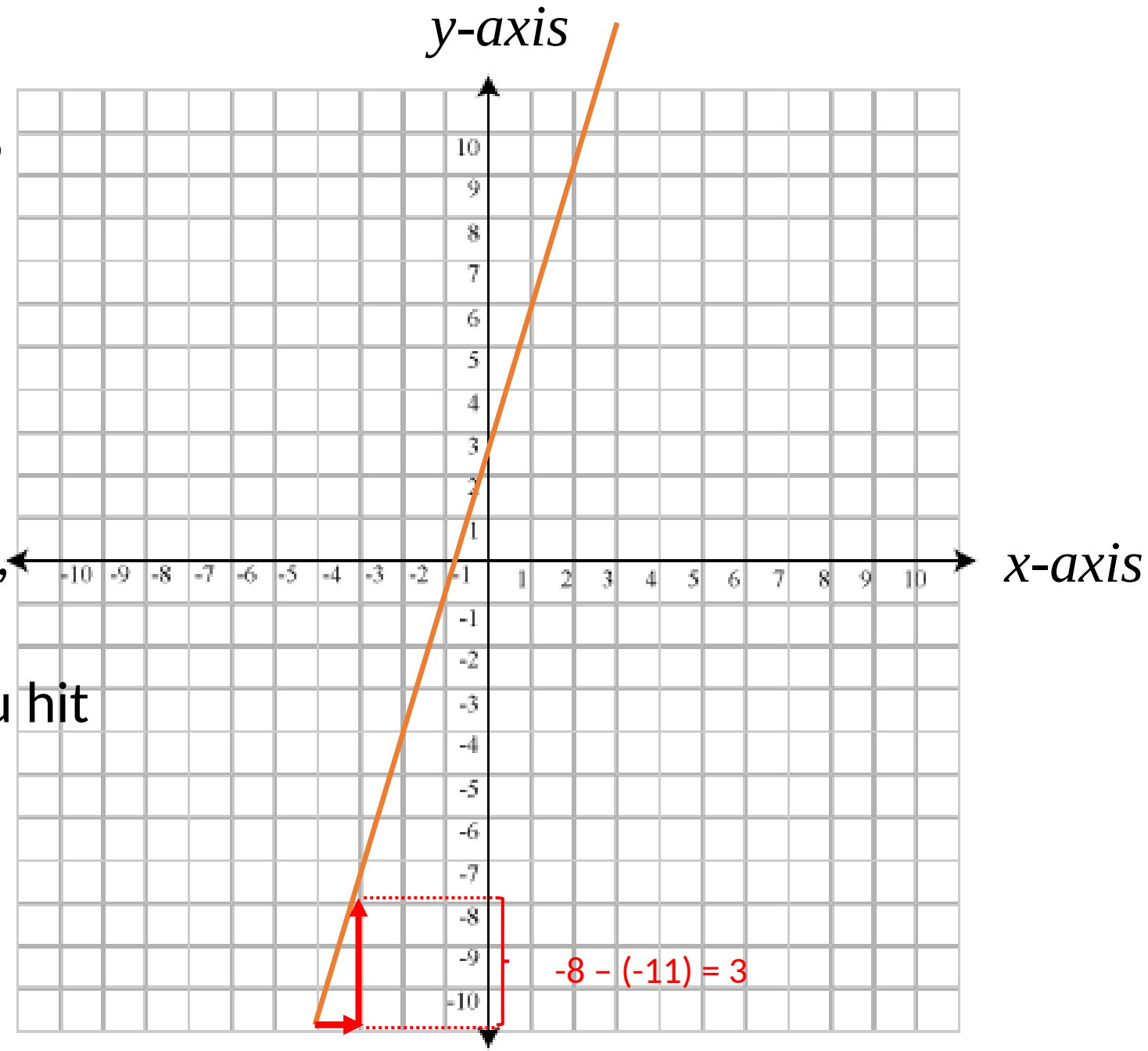

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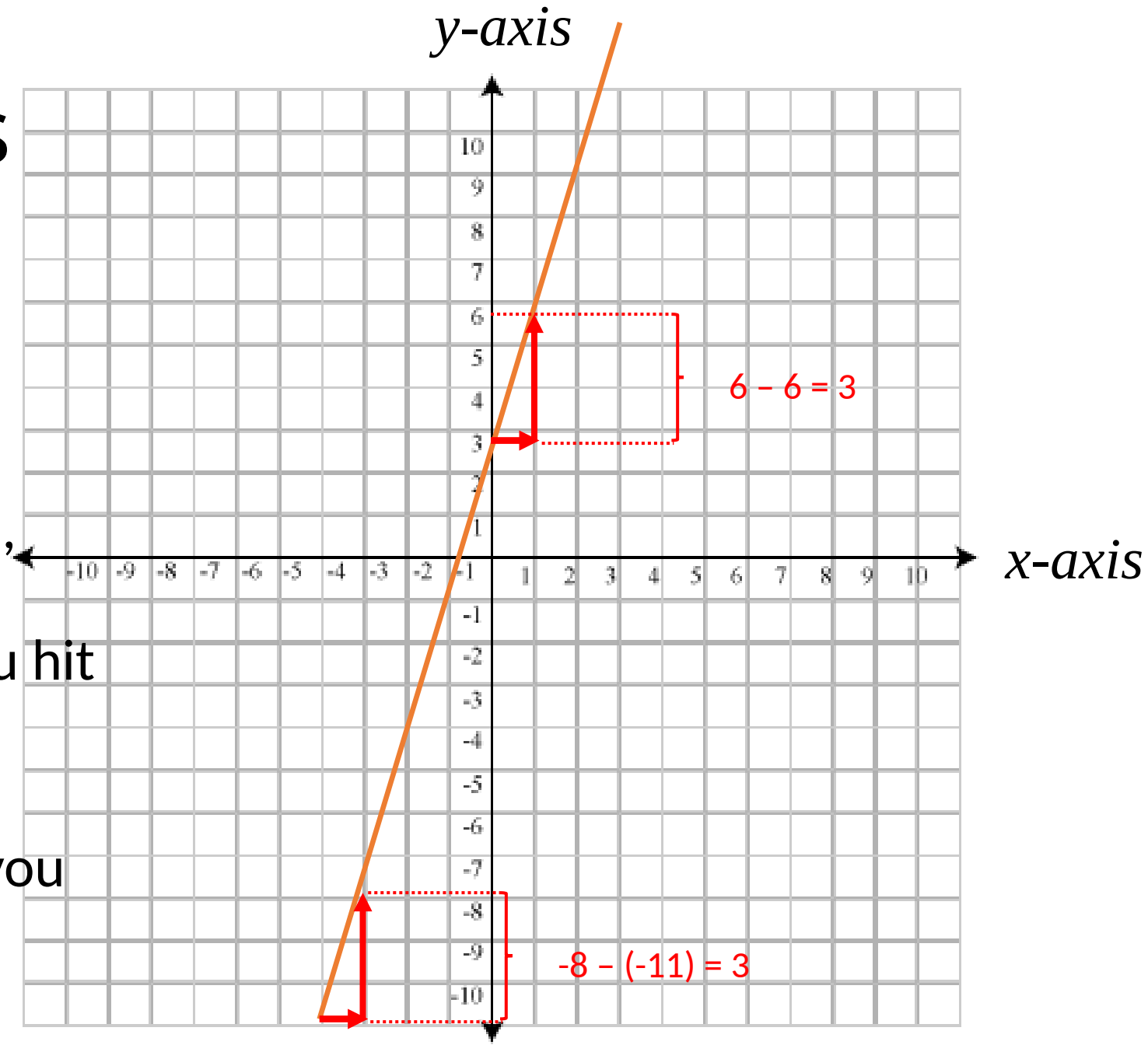

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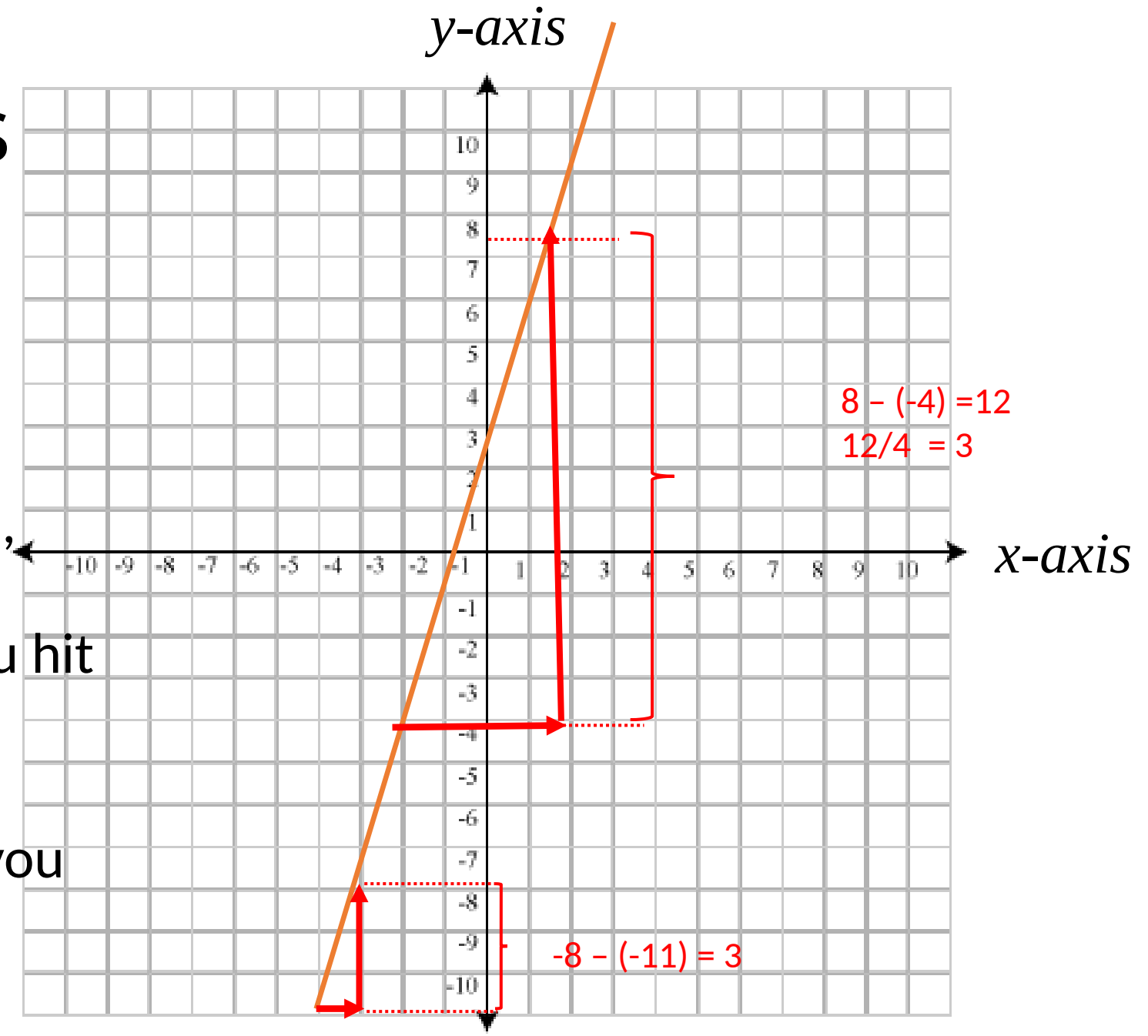

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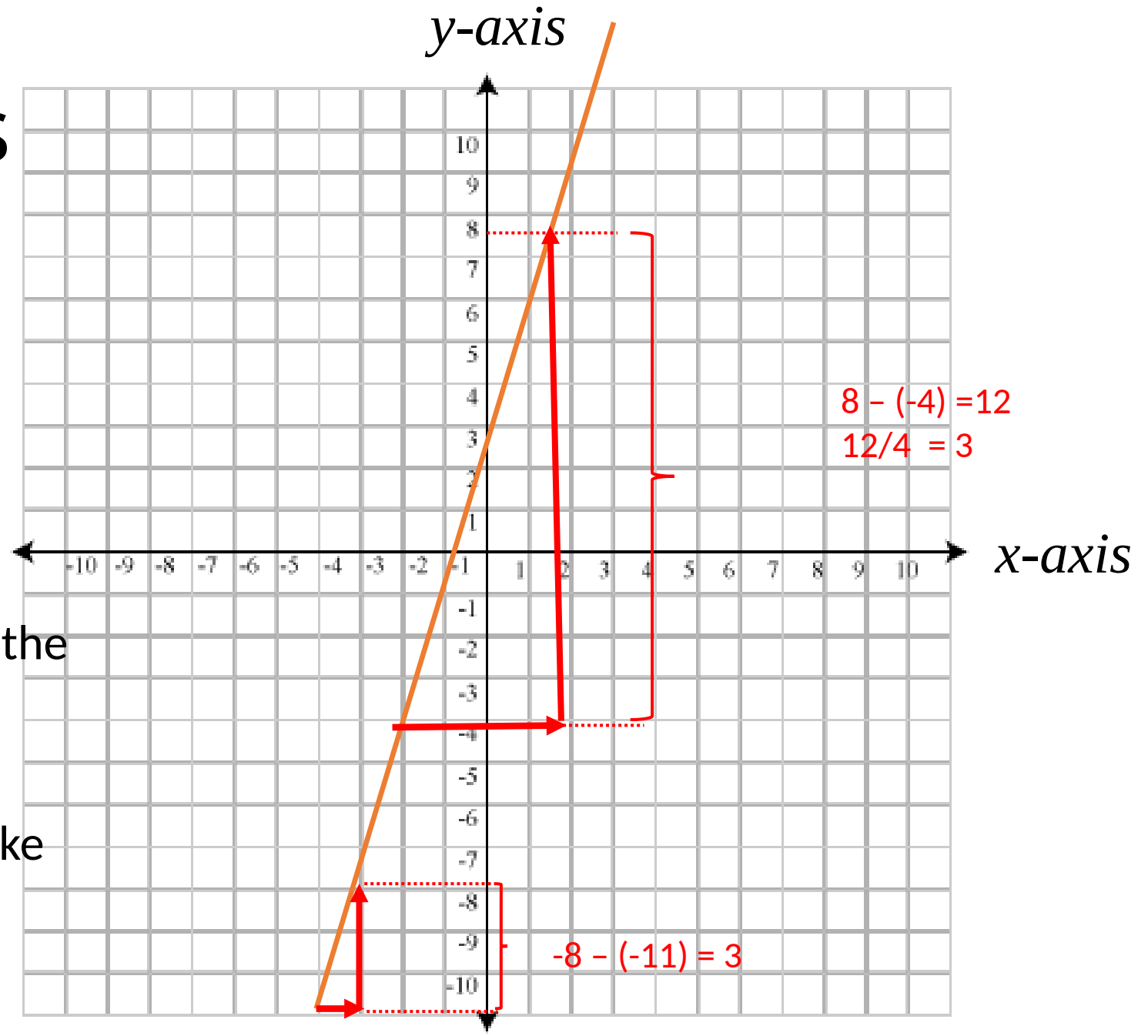
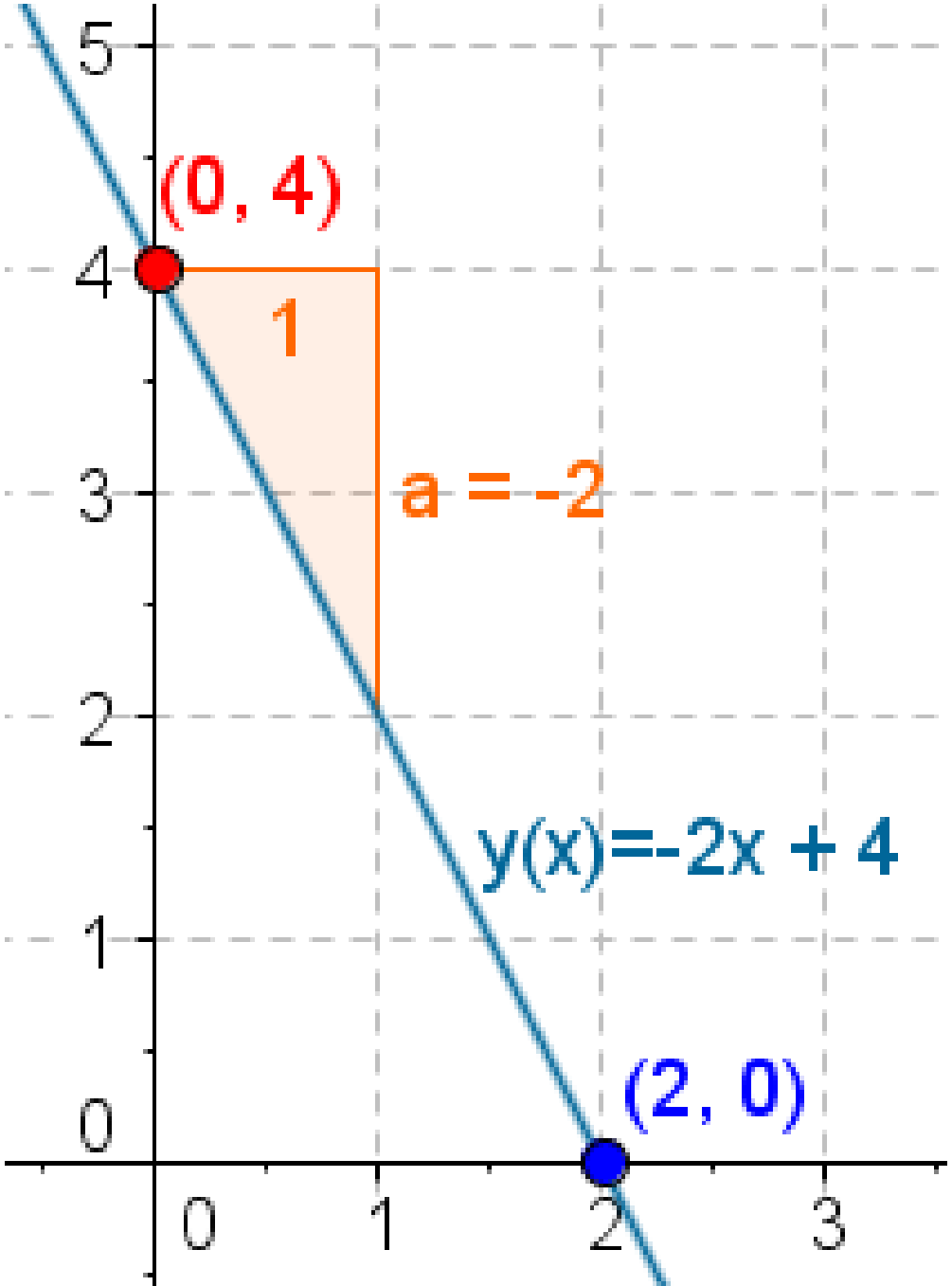
- 3. That's m!
- You can do that *anywhere* you like
- Y = 3x + 2.5



Linear functions

$$y = m\,x + b$$

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



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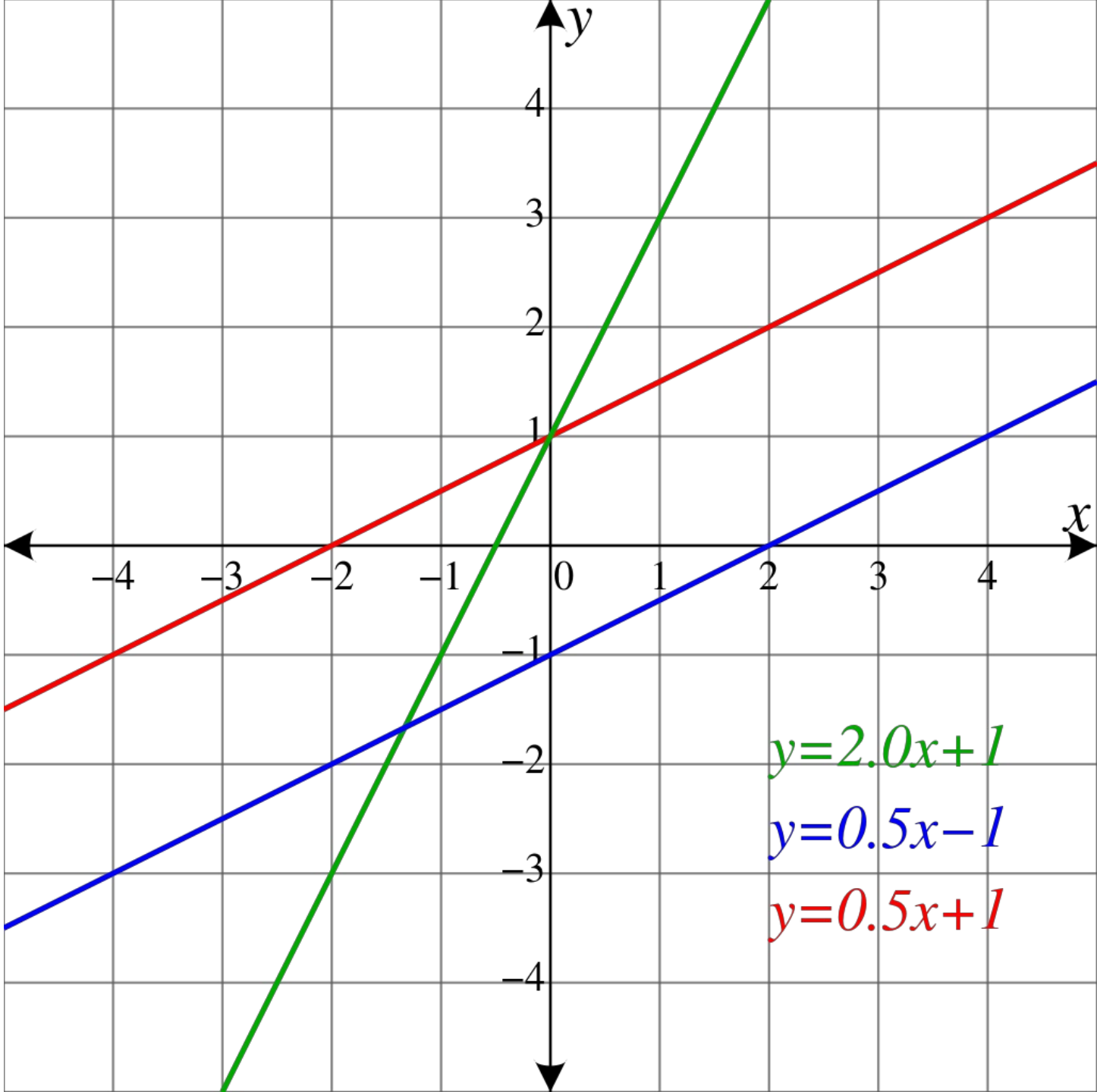

Do it now!

- 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?
- Which parameters do we estimate for a single regression line?