Statistics
with
Spa**RR**ows
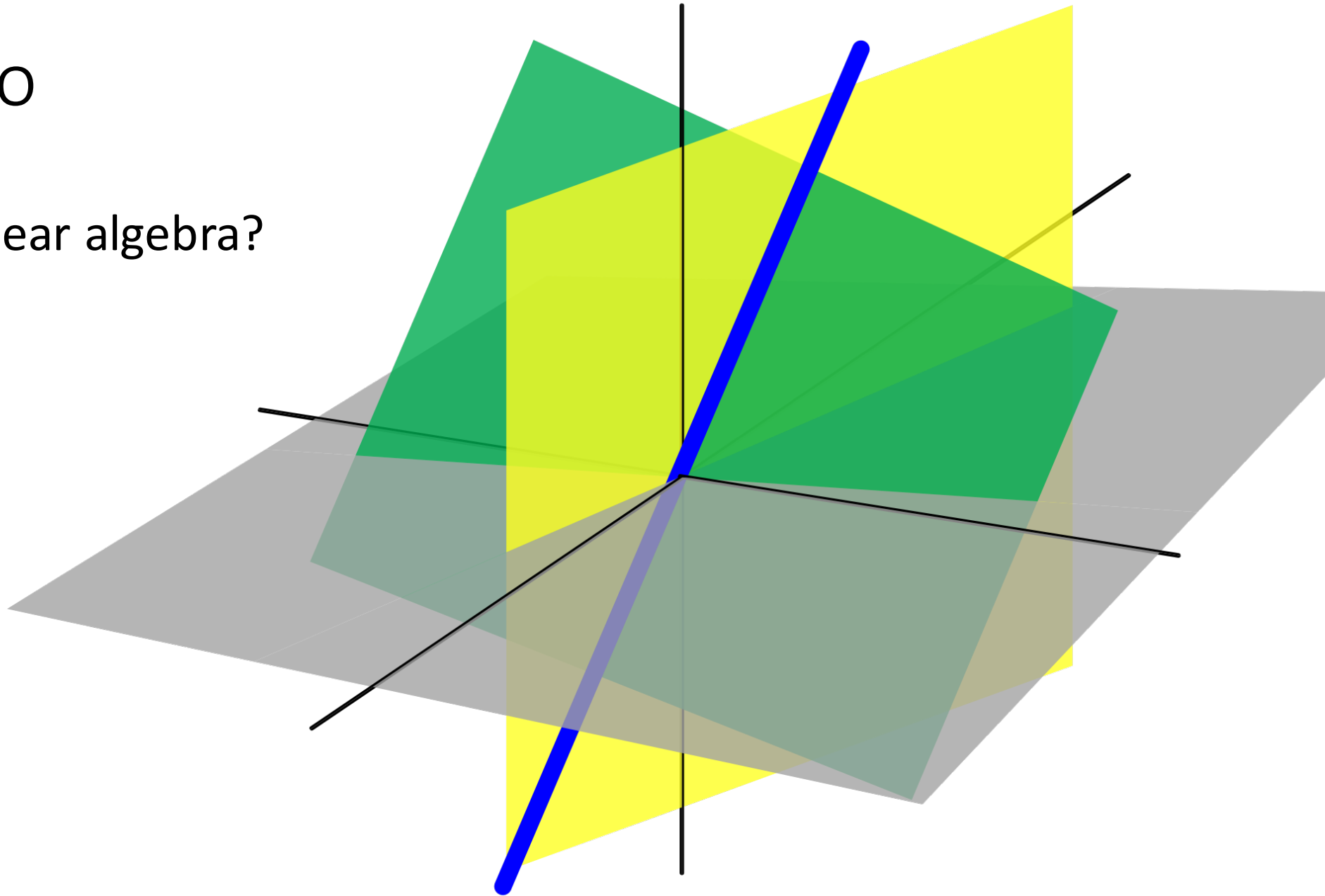
Lecture 8

Julia Schroeder

Julia.schroeder@imperial.ac.uk

Outline

- Linear functions

Here we go

- Remember, linear algebra?

More examples:

- Remem

Linear algebra catch-up

- Decartes to the rescue!

Cartesian coordinates
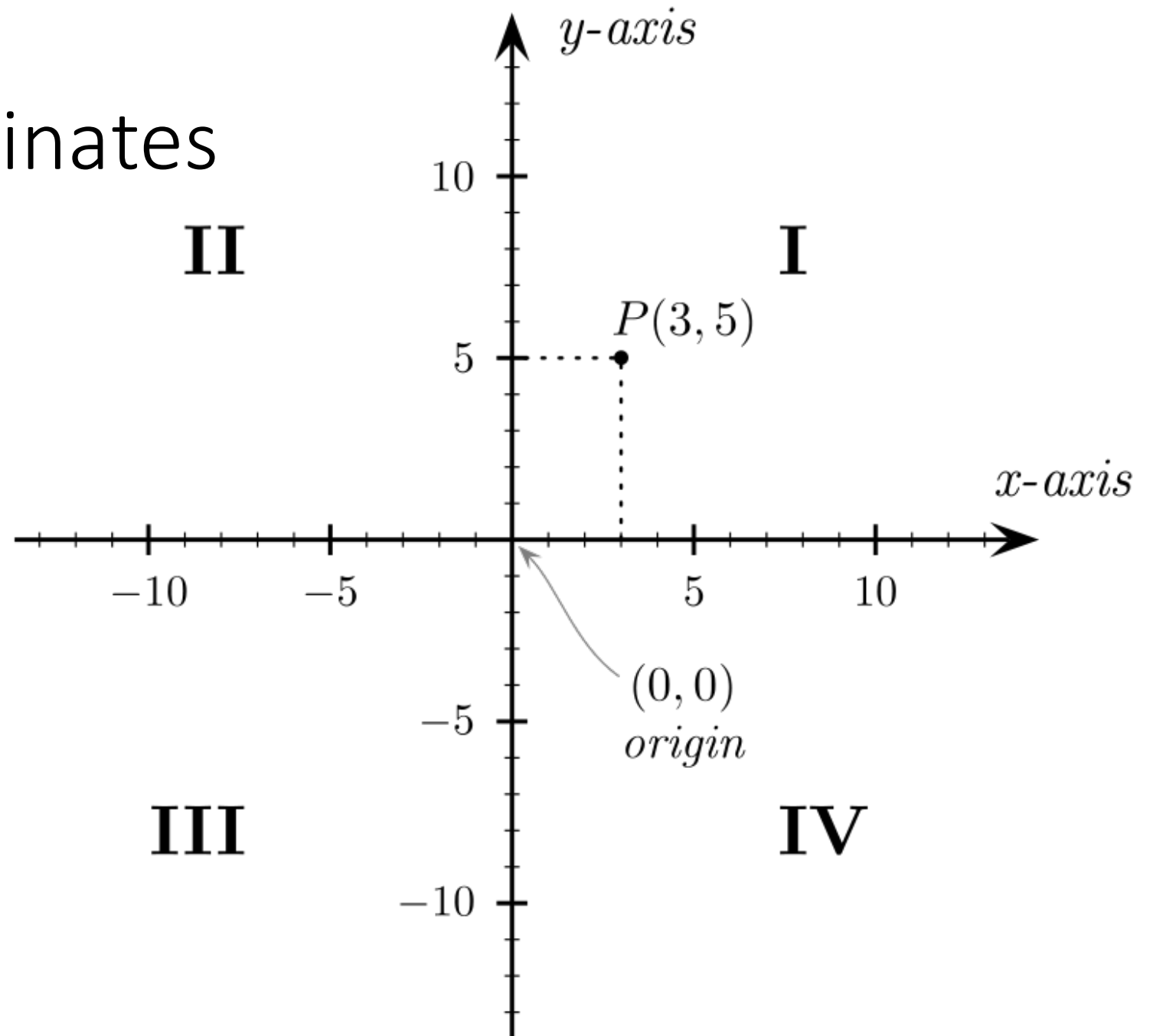
Can describe any point with coordinates x,y

P (3, 5)

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

Cartesian coordinates

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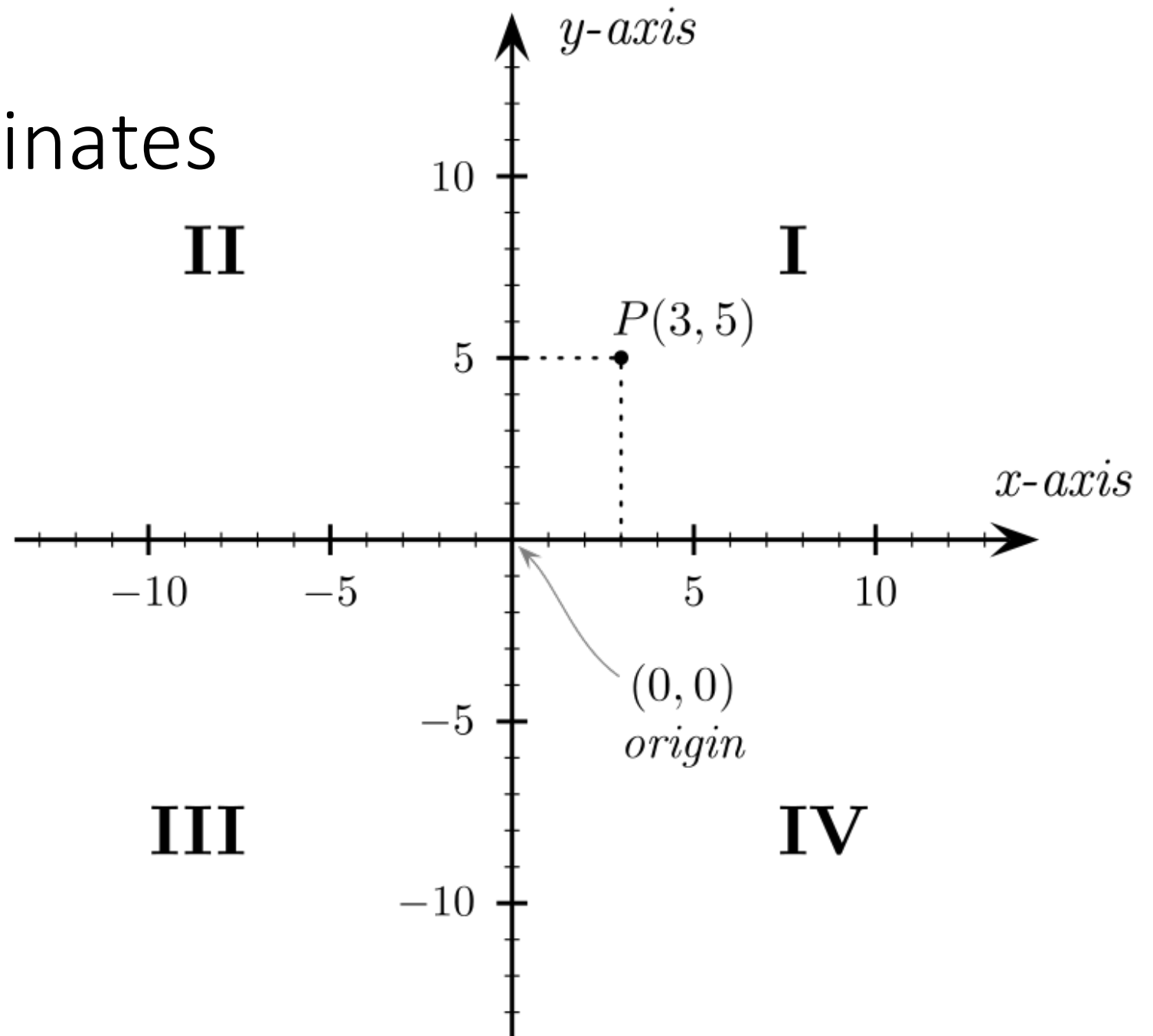
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Statistical conventions
Y is response variable
X is explanatory variable

Cartesian coo

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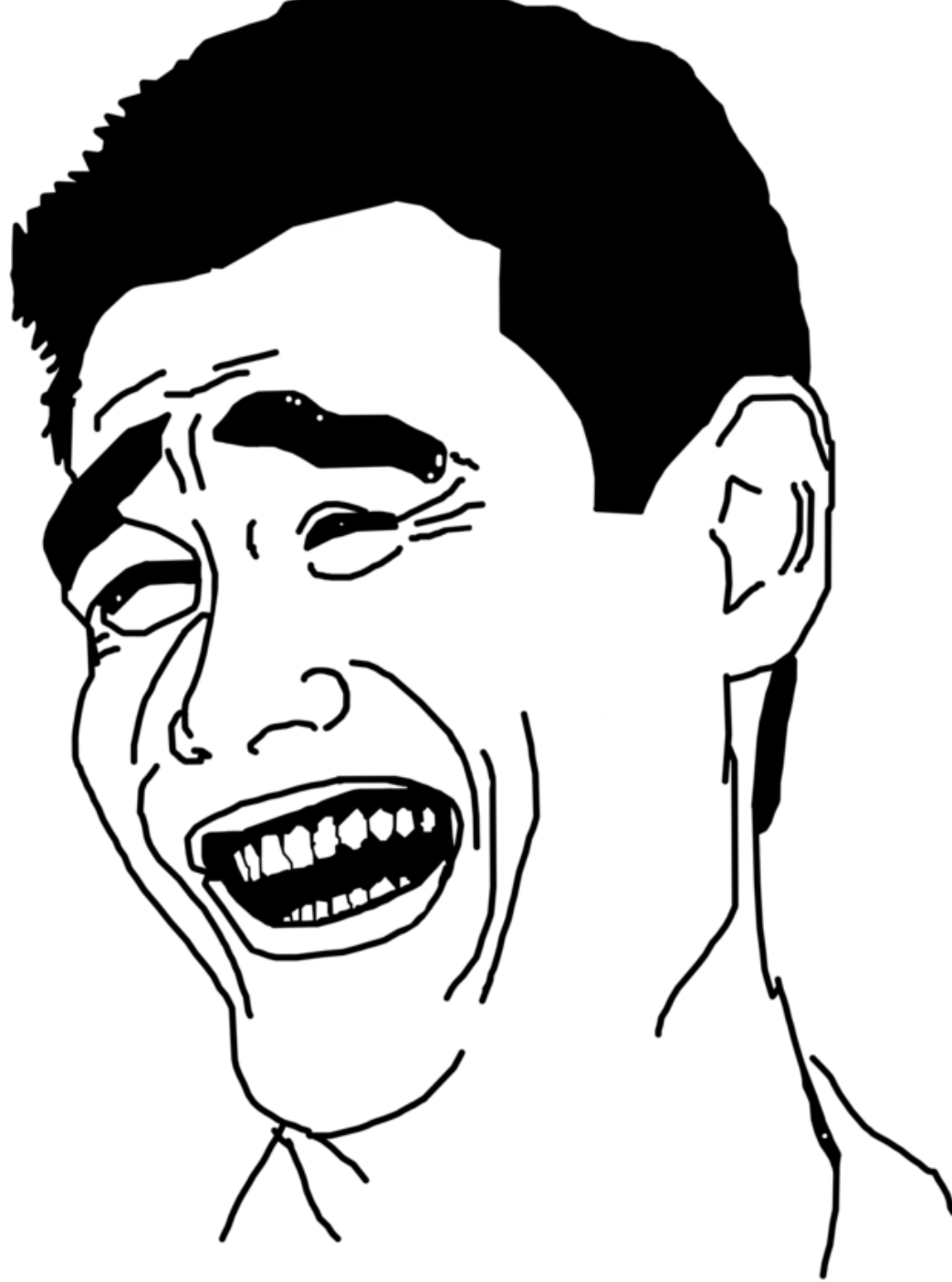
P (3, 5)

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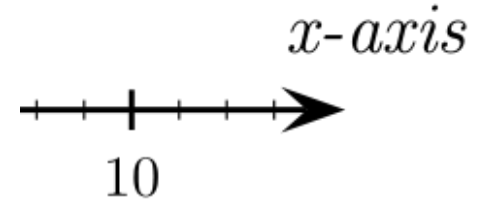mention x first.
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Statistical conventions
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[

$x\text{-}axis$

10

[V

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
- …

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- Sometimes unclear:
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- **When analysing data ALWAYS get it straight what is response and what is explanatory!**
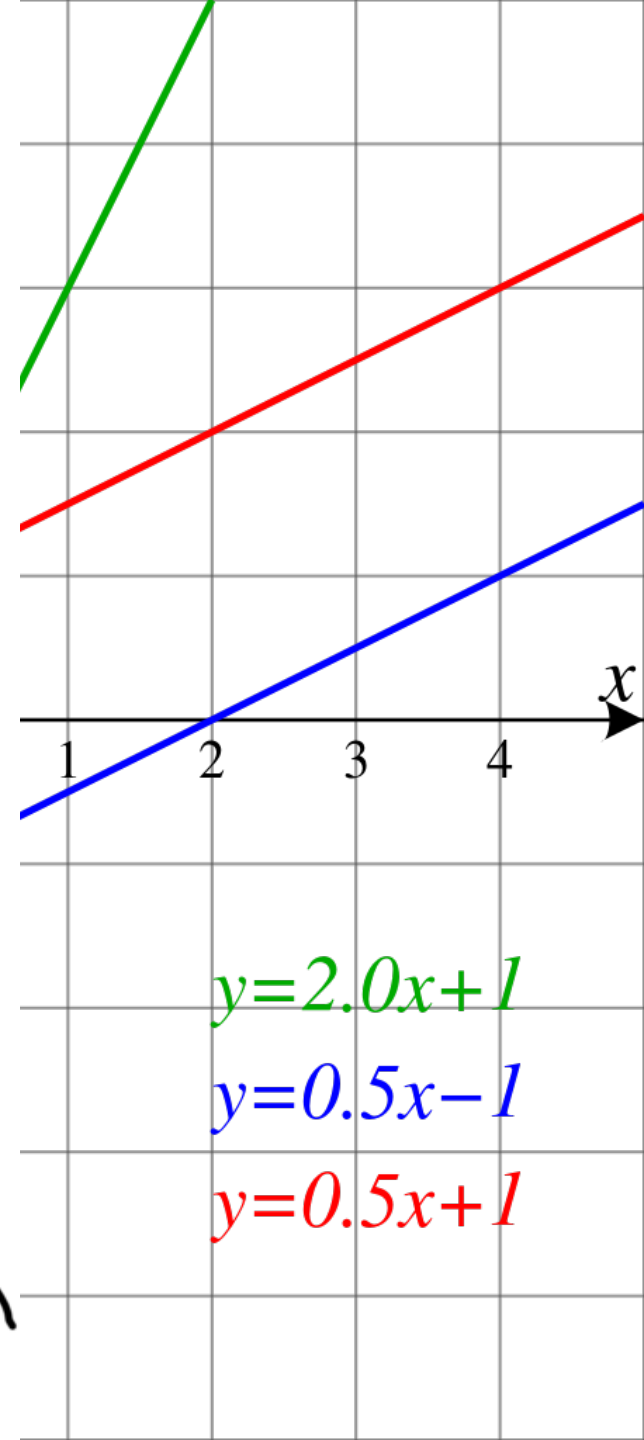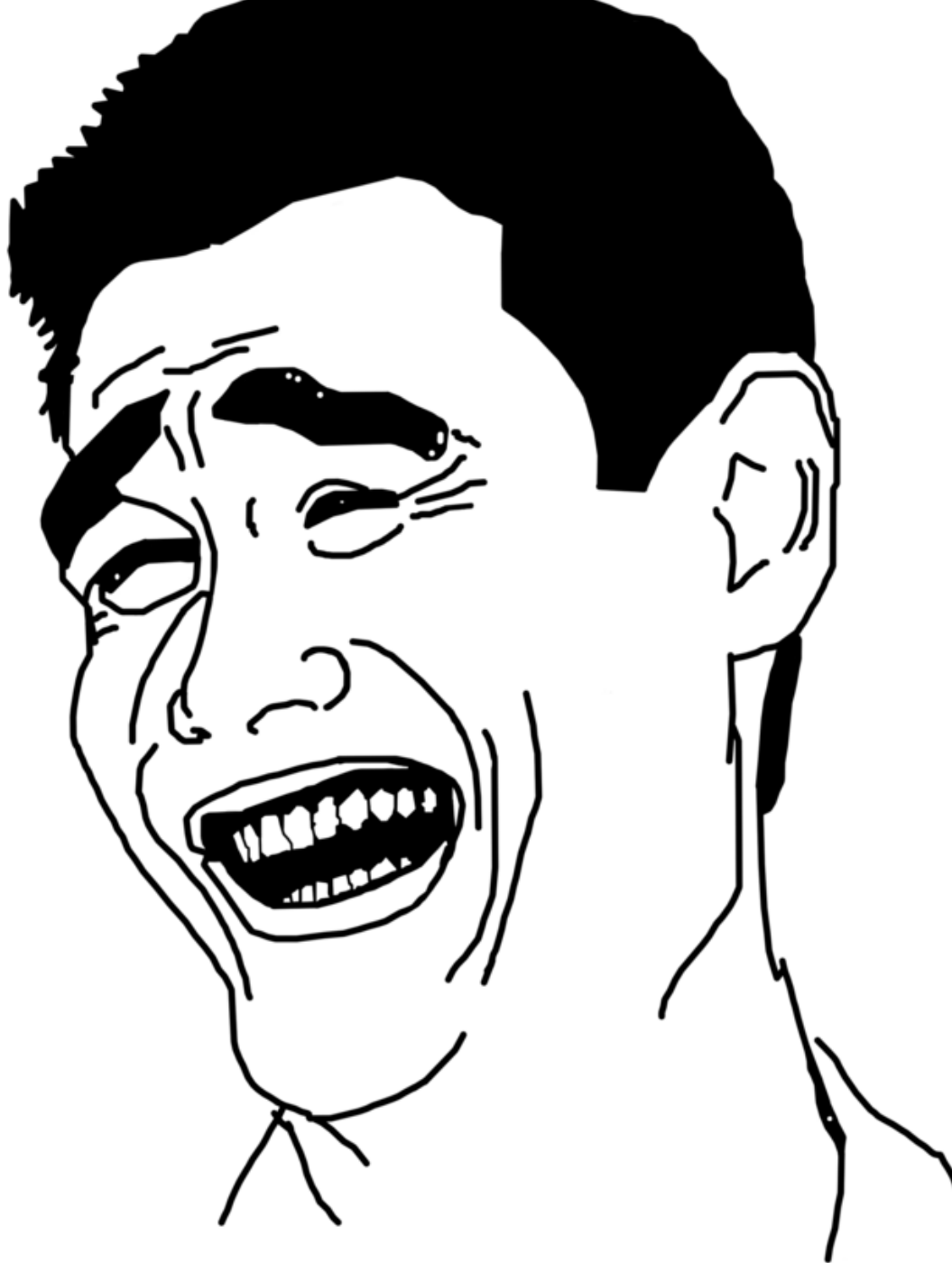
Linear functions

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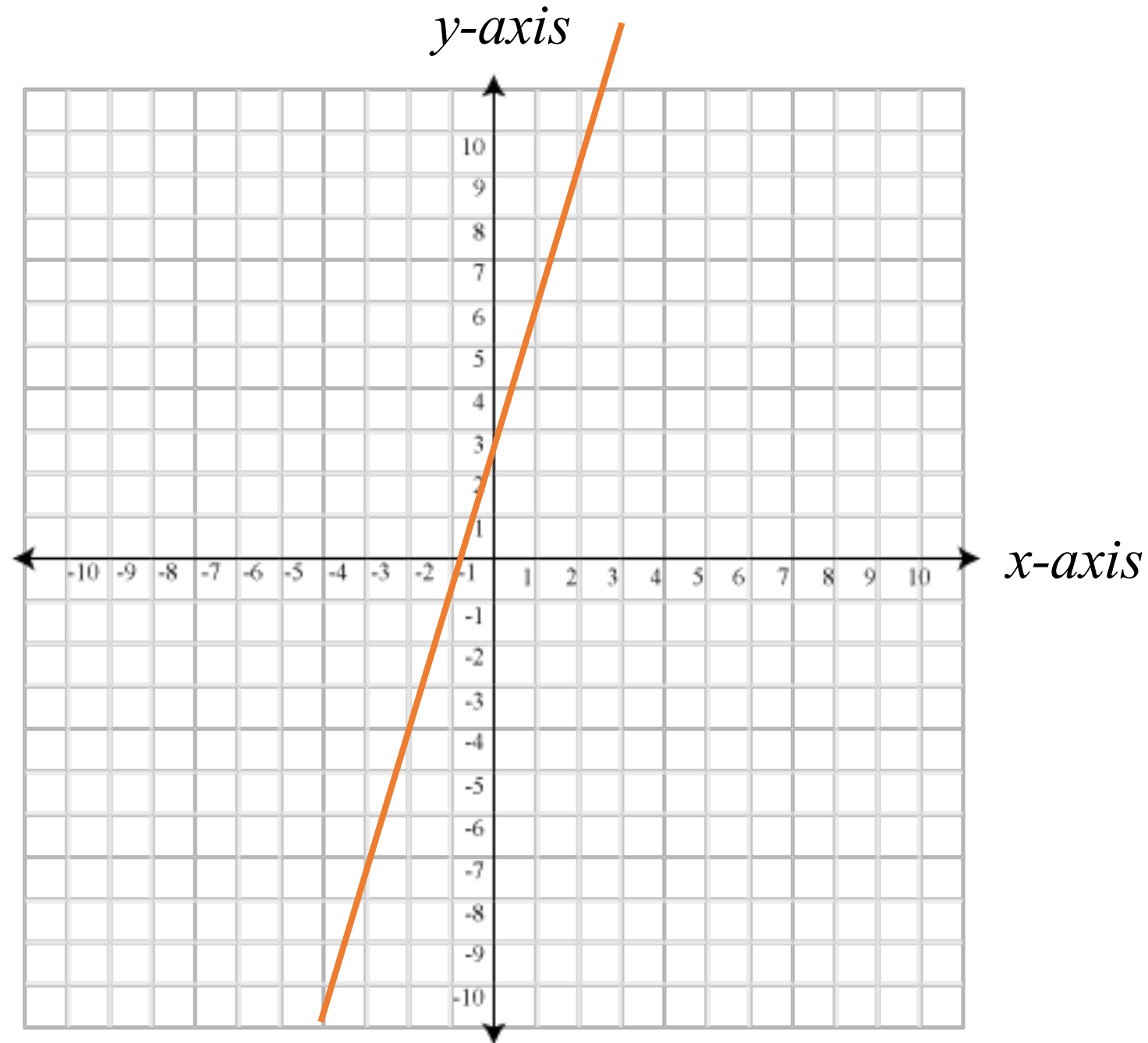- y coordinate dependent on x
- m = slope
- b = intercept

$y=2.0x+1$

$y=0.5x-1$

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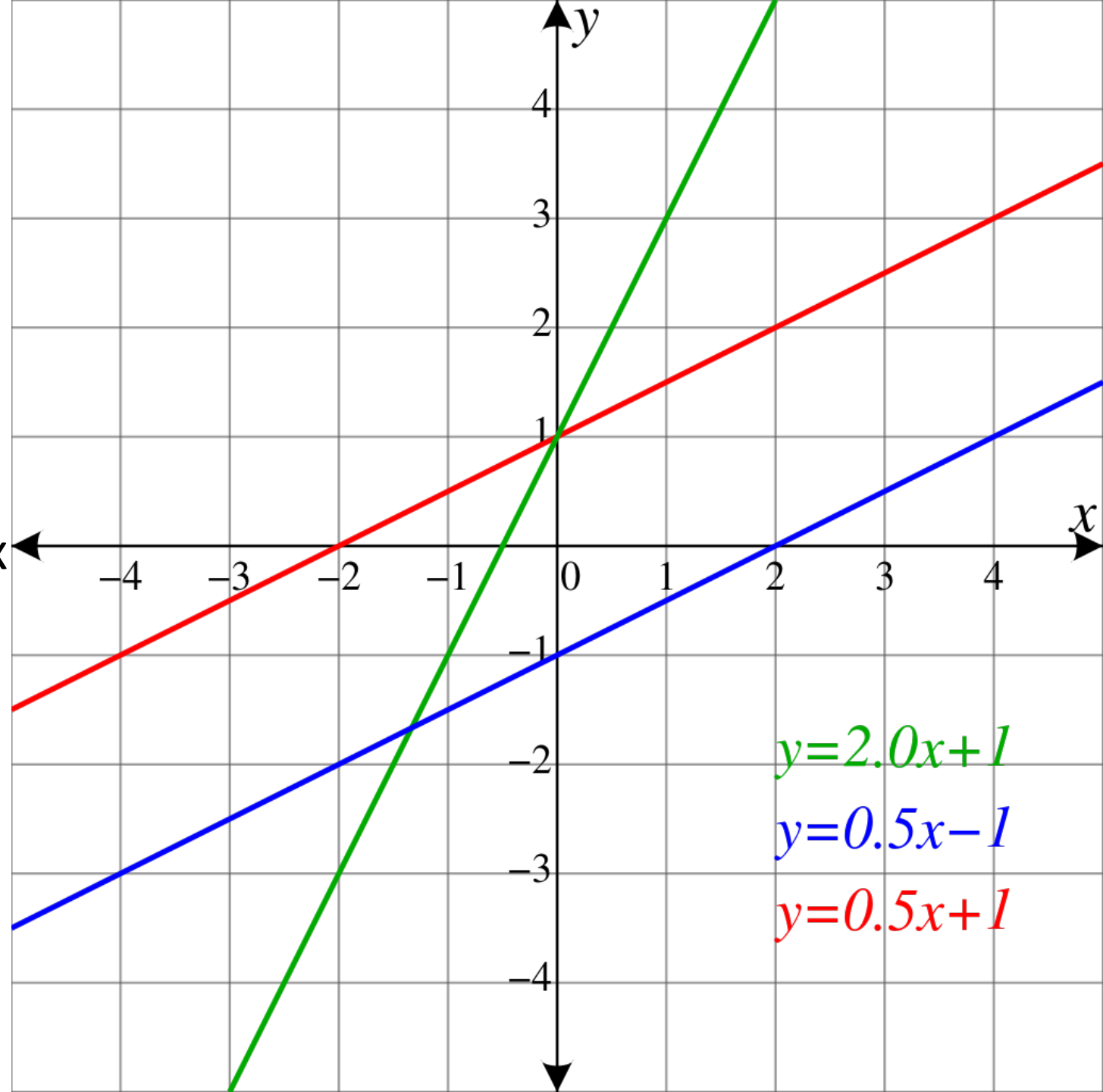
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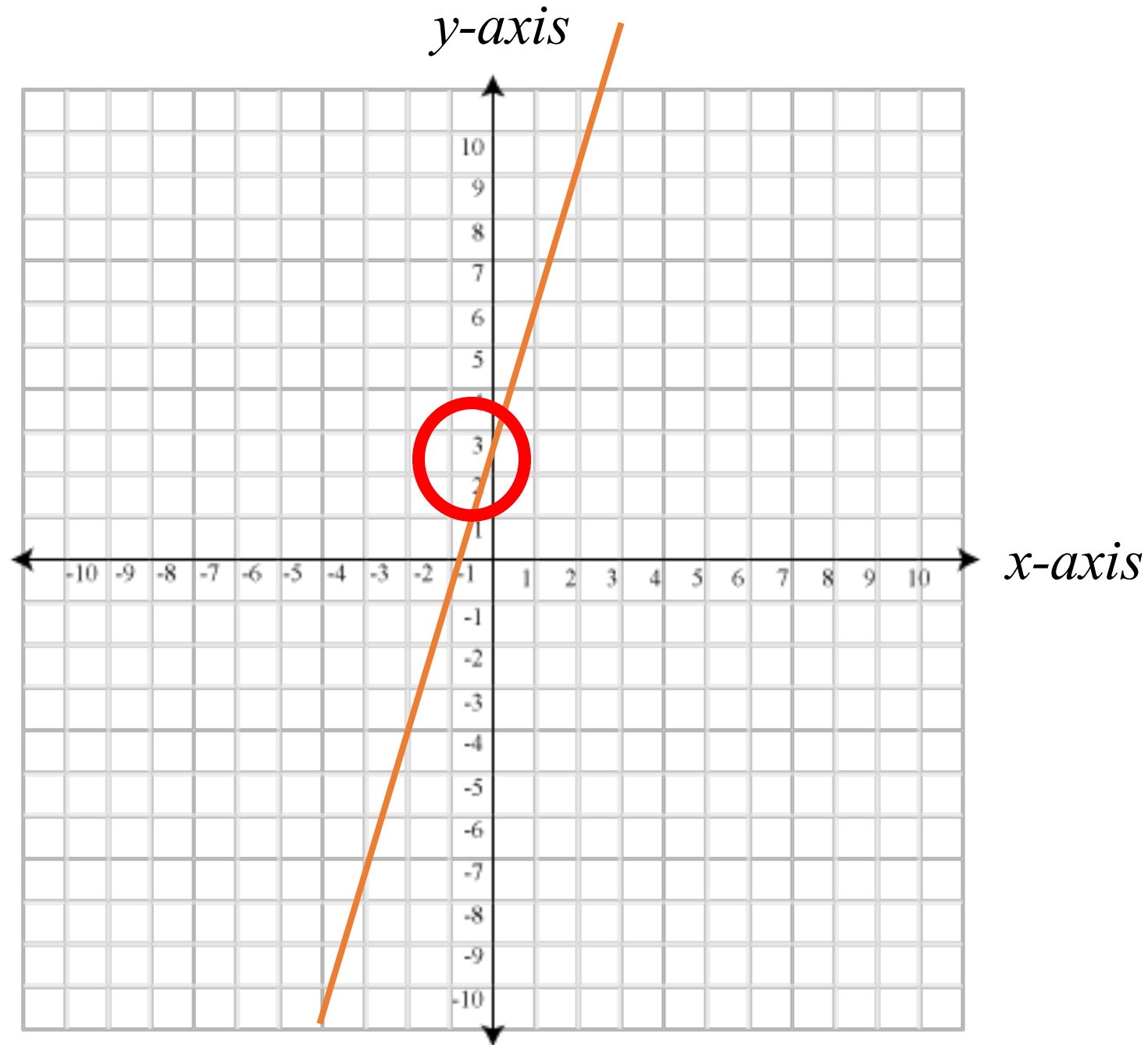
Linear functions

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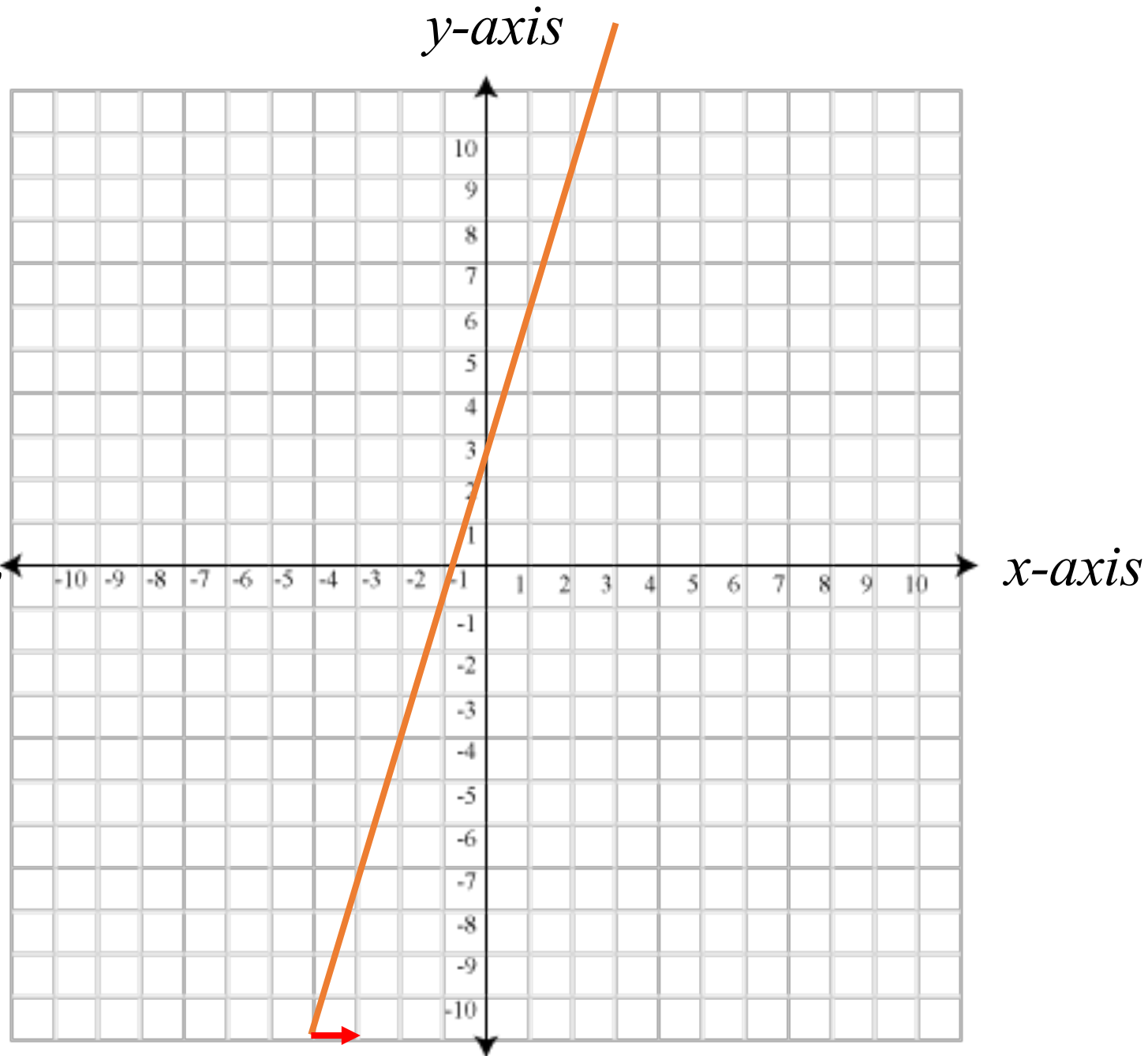
Linear functions

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- 2.5. That's b!

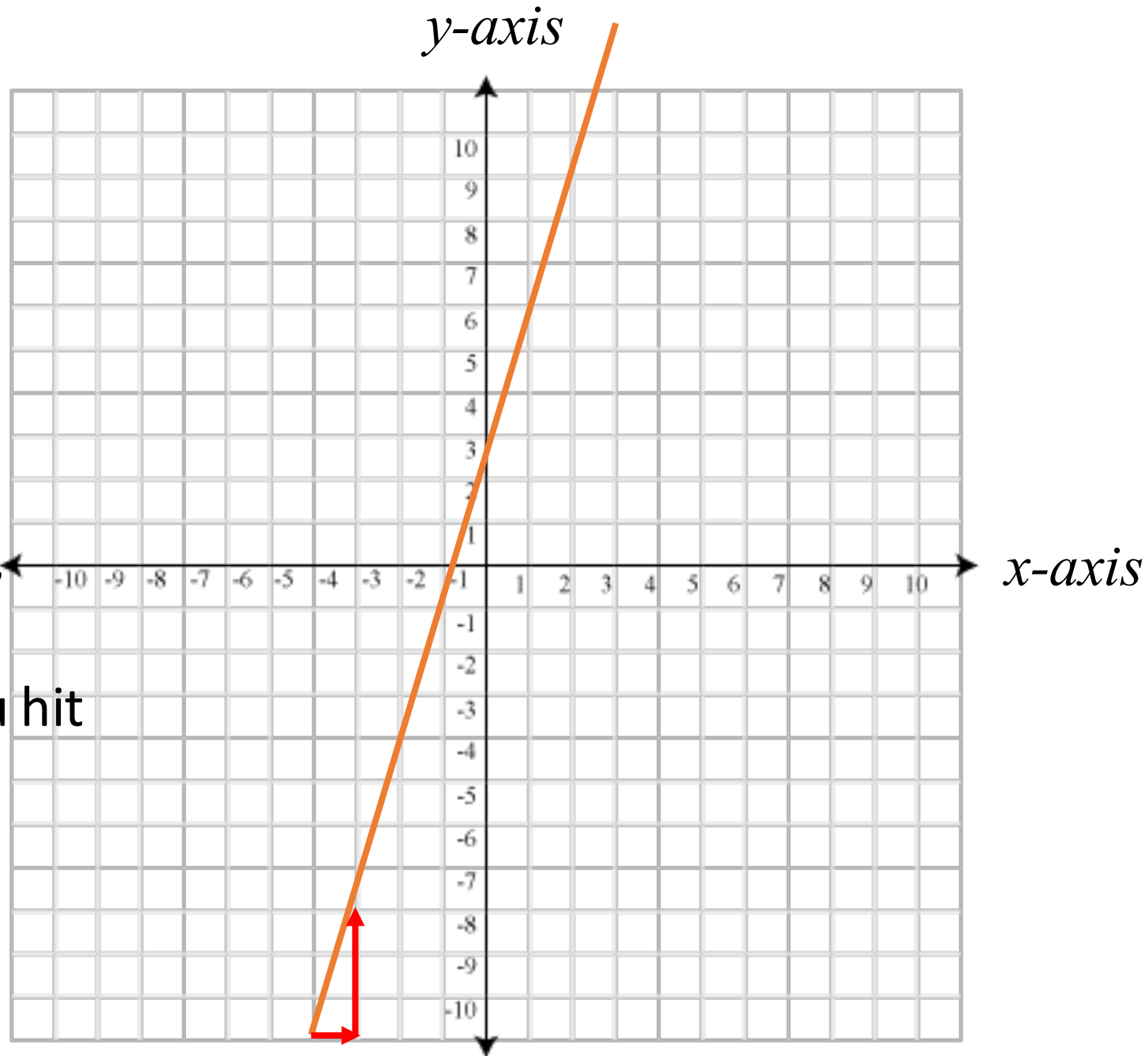# Linear functions

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- 3. That's m!

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y-axis

x-axis

-8 – (-11) = 3
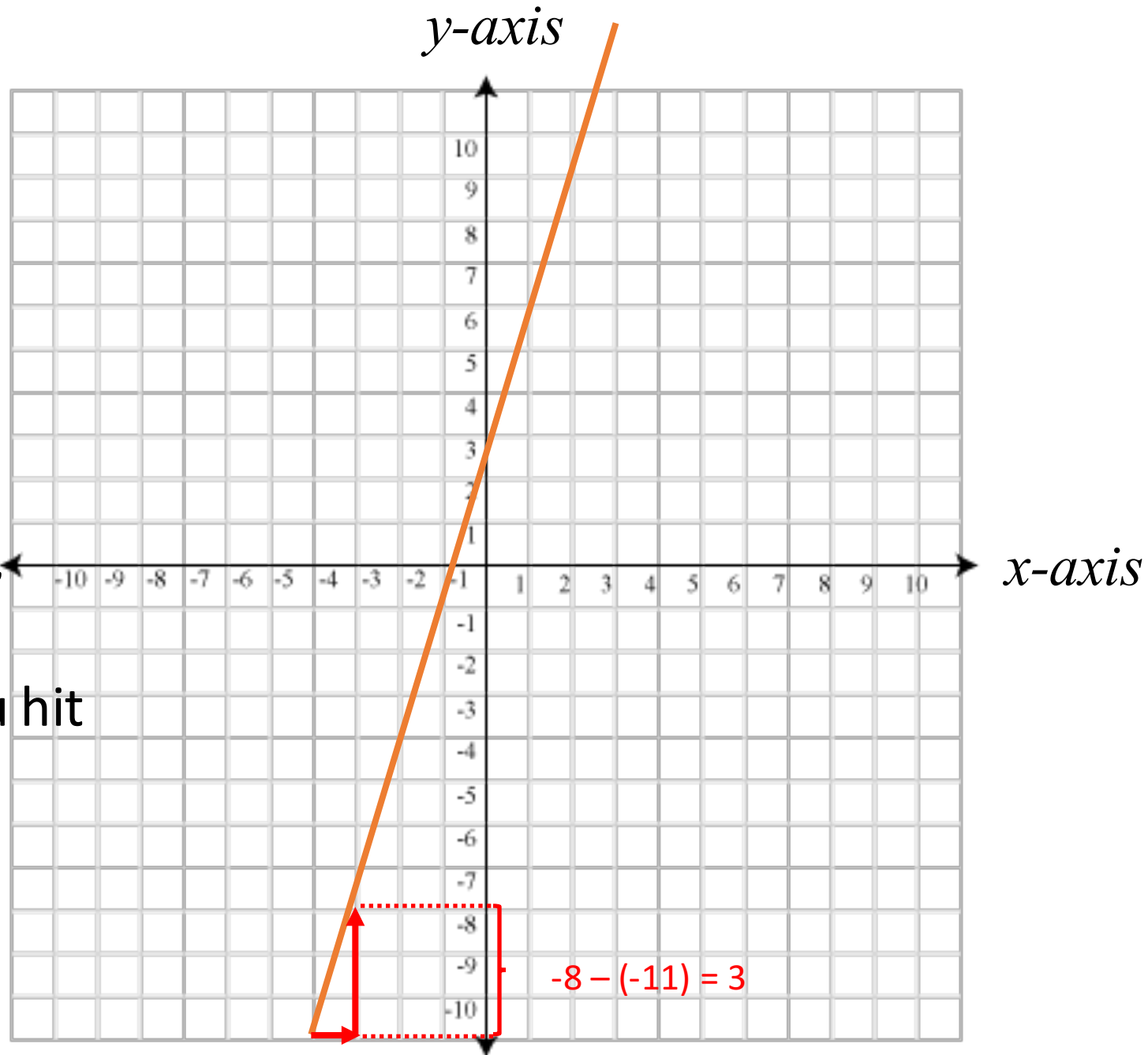
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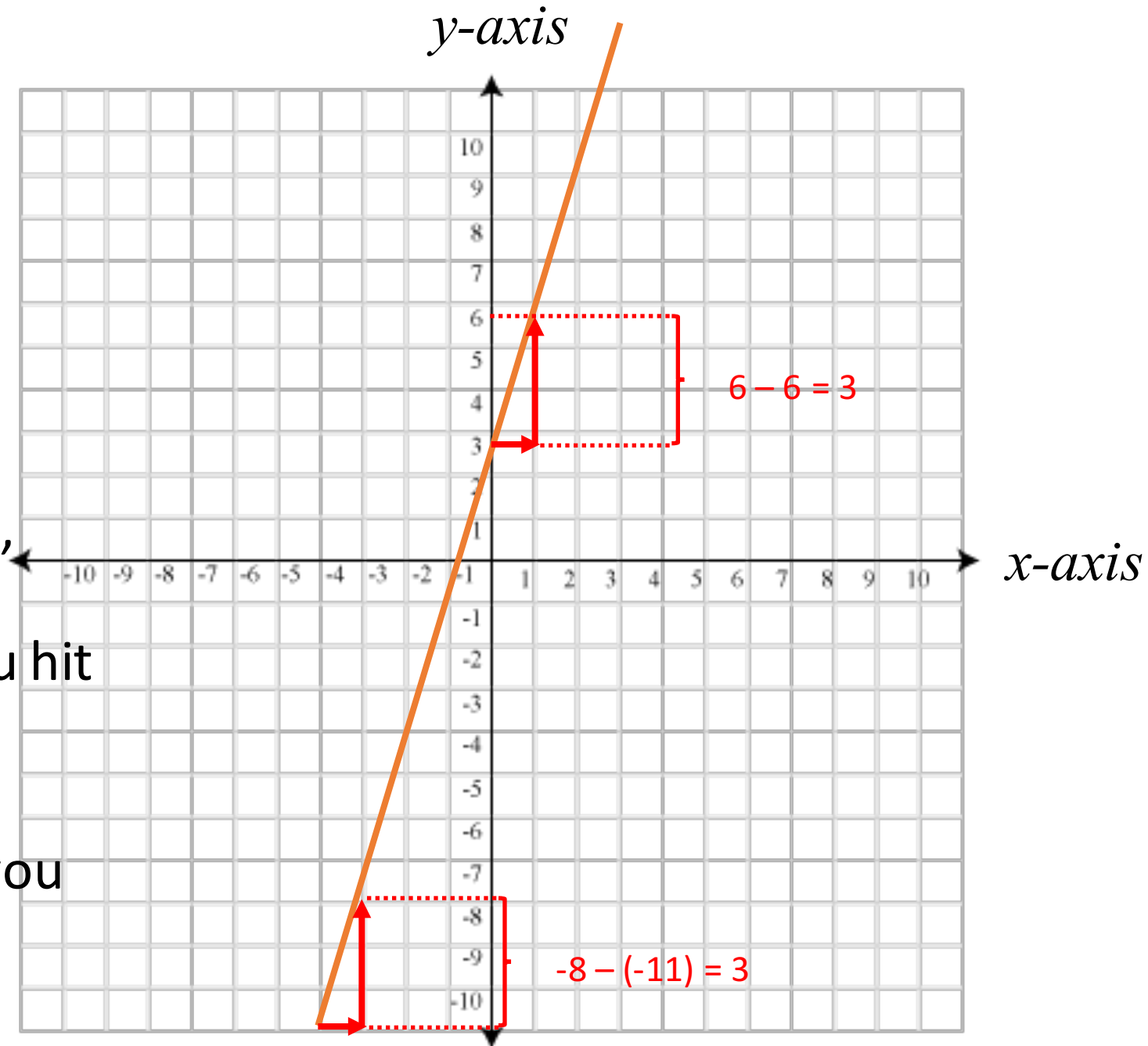6 – 6 = 3

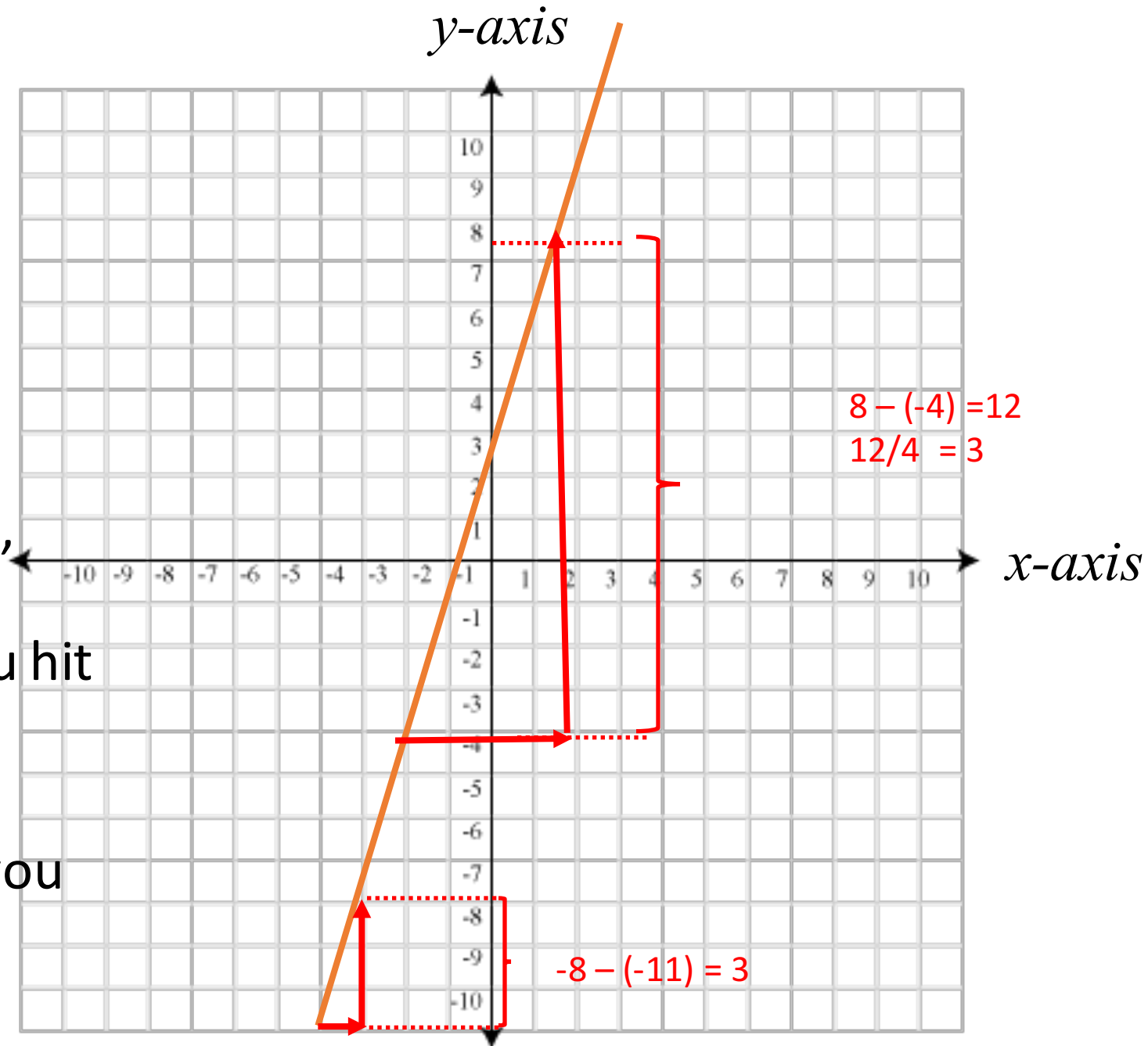-8 – (-11) = 3

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x-axis

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12/4 = 3

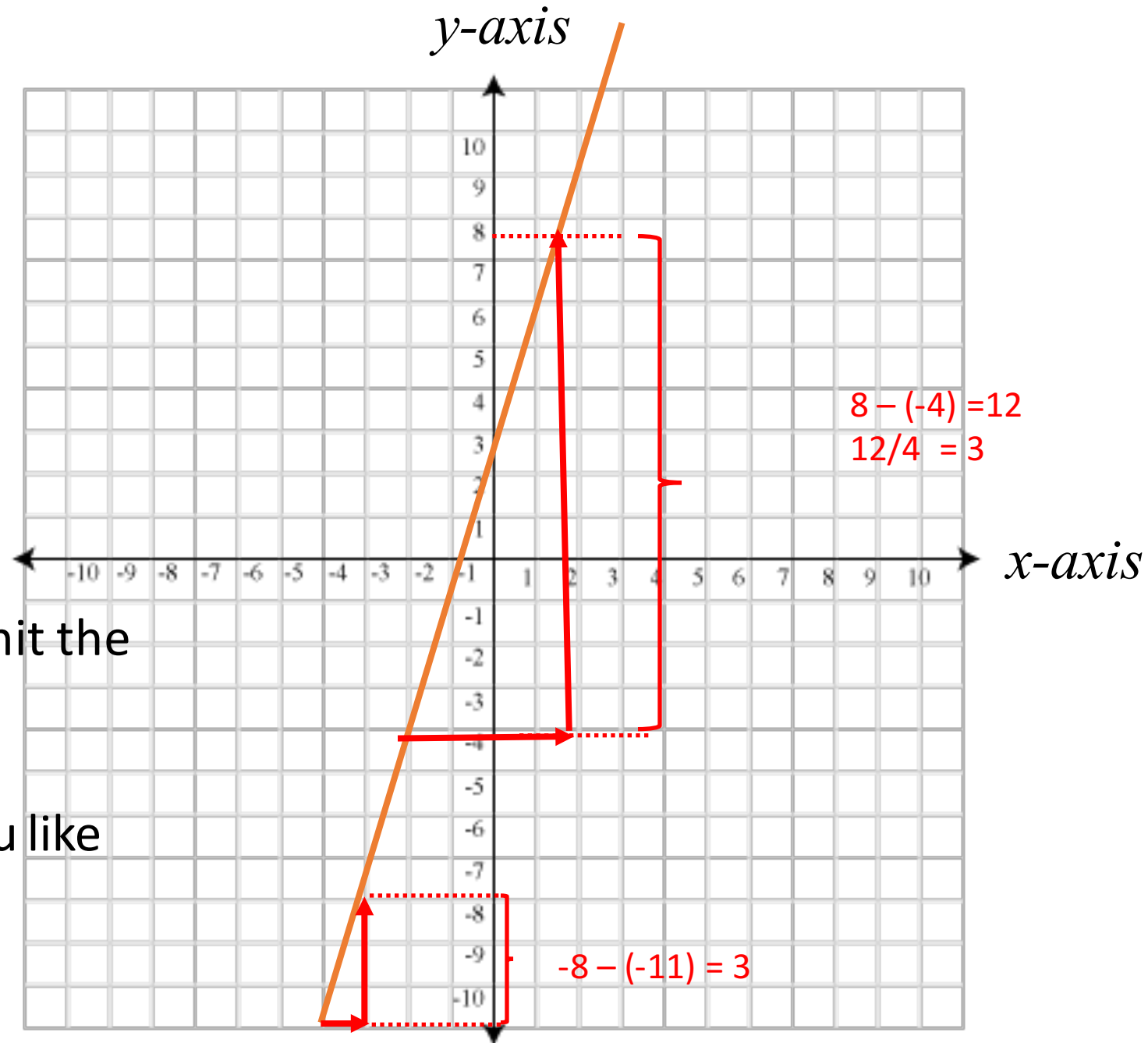-8 – (-11) = 3
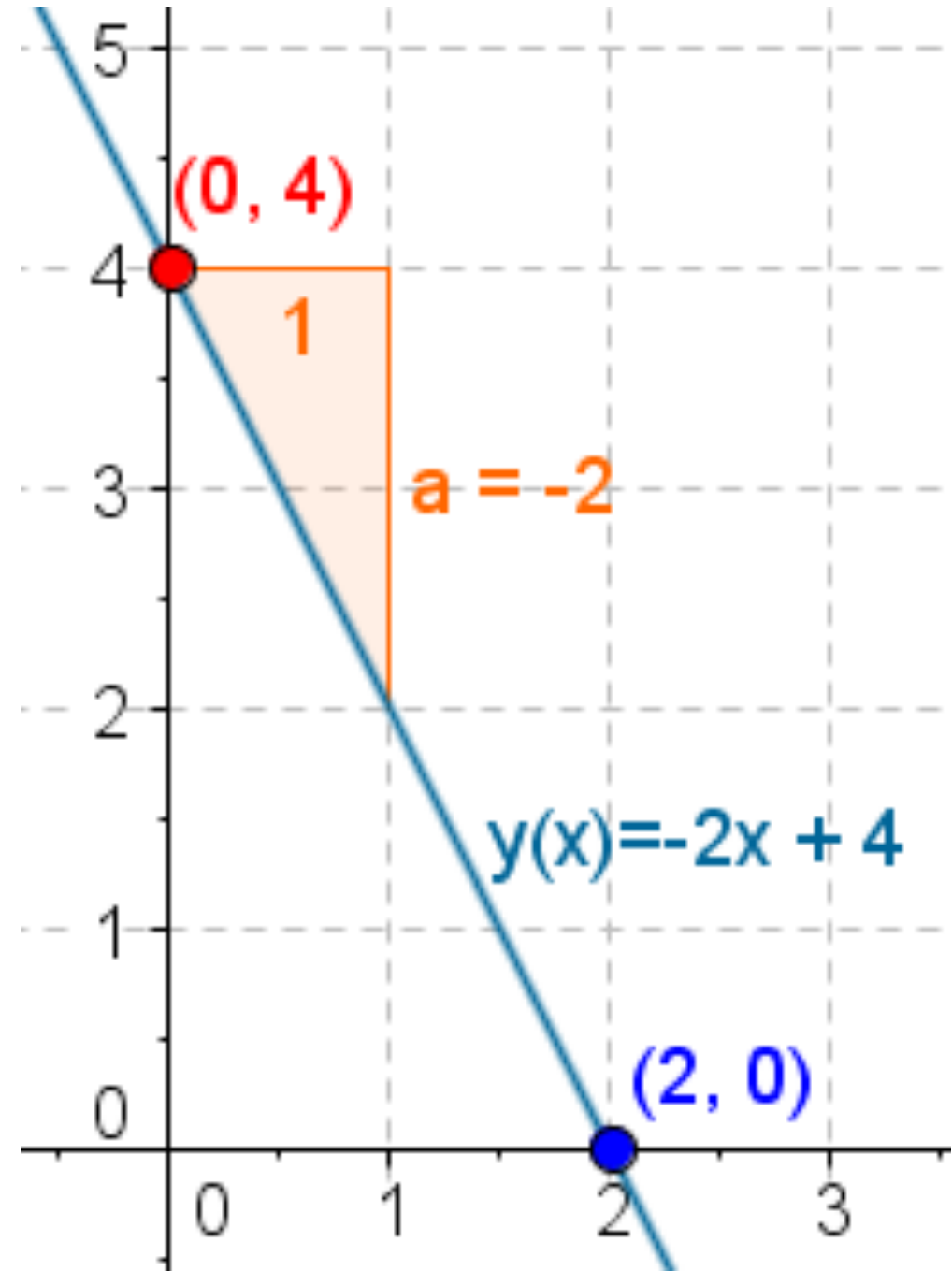
Linear functions

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

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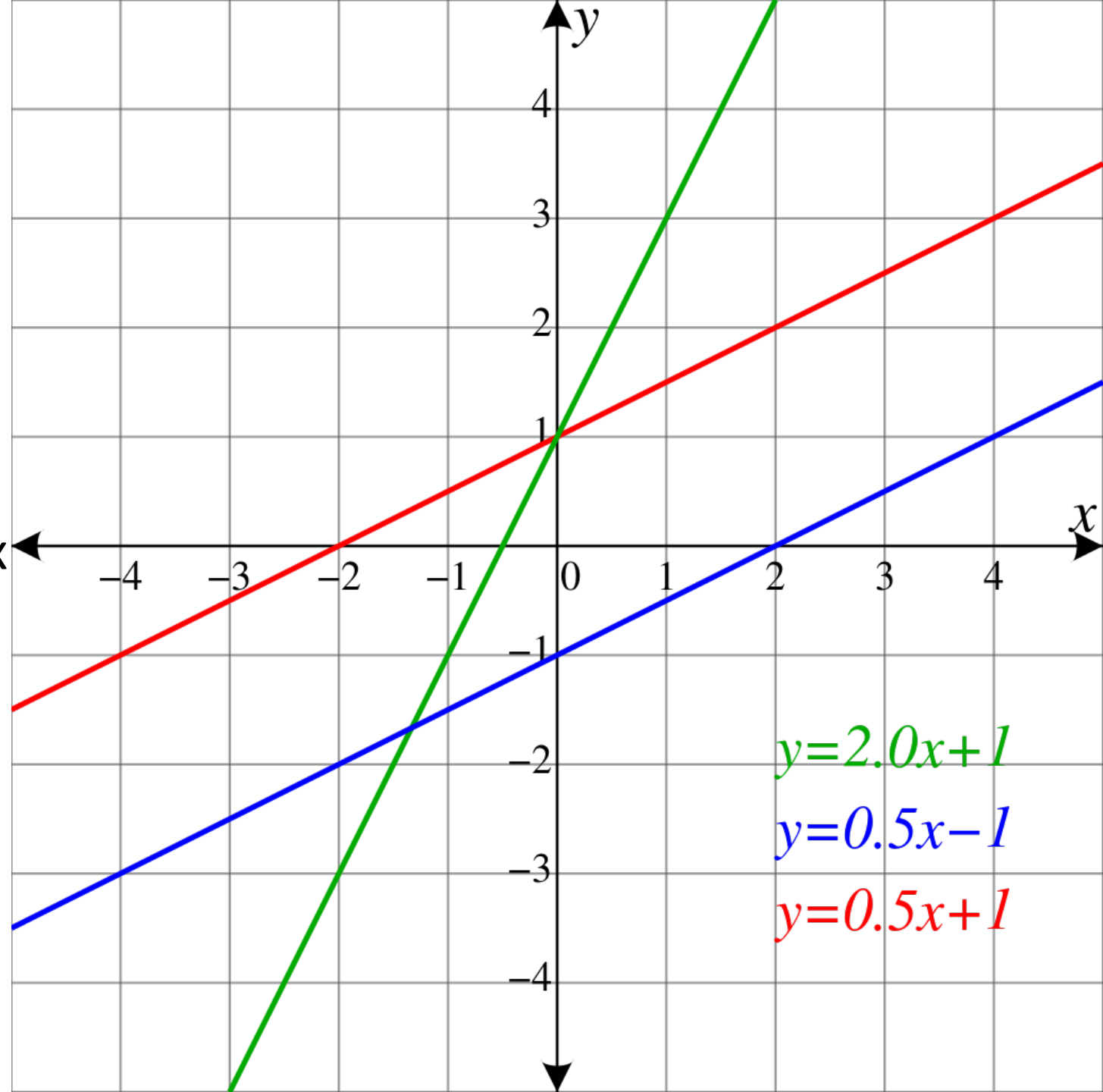
8 – (-4) =12
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-8 – (-11) = 3

Linear functions

y = m x + b

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

(0, 4)

1

a = -2

y(x)=-2x + 4

(2, 0)

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Do it now!

- How many df's for a line anywhere ? 2: x, y

- Df for a line that goes through the origin P(0,0)? 1: fixed intercept

- Df for a line with slope 1, and variable intercept? 1: fixed slope

x, y: vector of data
m, b: parameters, numbers, not distribution of data