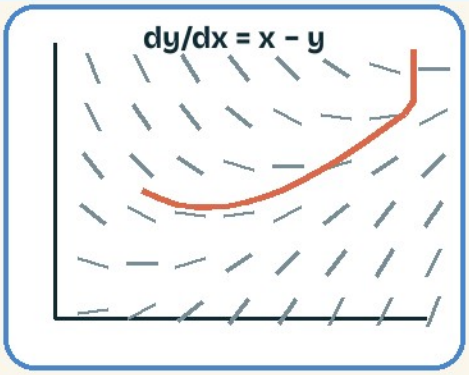
Differential Equations

Rules for how things change

WHAT IS IT?

A differential equation describes how a quantity changes, using its rate of change, such as how fast a population grows or a cup of tea cools. Solving it means finding the function that follows that rule.



THE BIG IDEAS

1. Start with a rule for the rate of change, like dy/dx = x − y.
2. A slope field draws the rule as tiny lines; solutions follow them.
3. Separable equations: move the variables apart, then integrate both sides.
4. An initial value picks one solution out of the whole family.

YOU SEE IT WHEN ...

- Cooling coffee and warming rooms
- Populations and spreading rates
- Springs, circuits and falling objects

WORDS YOU WILL MEET

Derivative
the rate of change of a function

Order
the highest derivative in the equation

General solution
a family of solutions with a constant C

Initial condition
a known starting value

Slope field
a picture of the rule as small slopes

Equilibrium
a value where nothing changes

GOOD TO KNOW FIRST

Calculus: derivatives and integrals.

IN YOUR COURSE YOU WILL ...

- Solve separable and first-order equations
- Model growth, decay and cooling
- Read slope fields and use Euler's method
- Solve second-order equations for springs and circuits

Start tip: Check any solution by putting it back into the equation.

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