

# 2 The derivative as a slope – Part 1

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

## Vocabulary

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*Write each word three times.***English****Write it 3 times** (English)

derivative

tangent

## Recall

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You already know about the gradient (slope) of a line:

- A steep line has a big gradient; a flat one has zero.
- Gradient = rise over run.
- But a curve's steepness keeps changing along it.

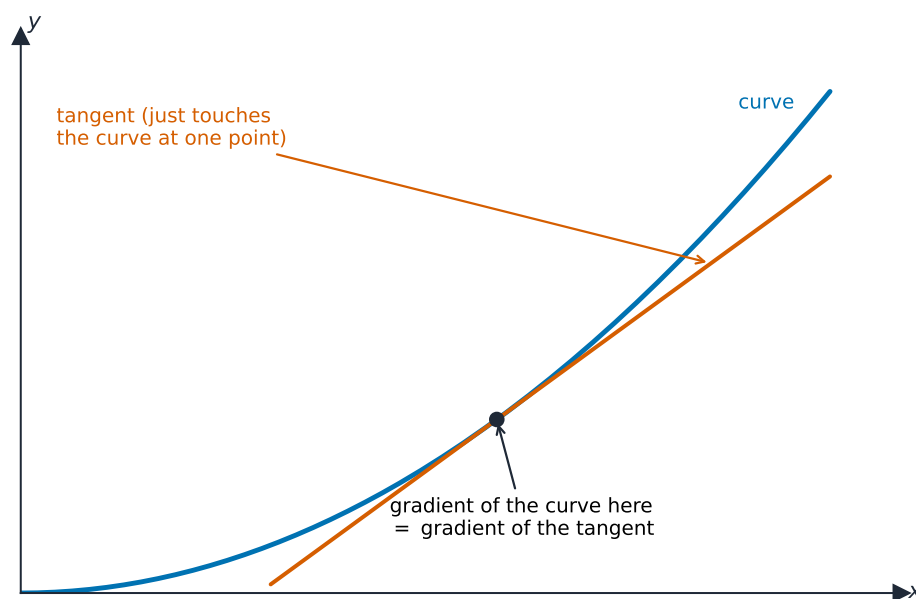
This sheet introduces the **derivative** – the slope of a curve. Each idea has a worked example.

## New ideas

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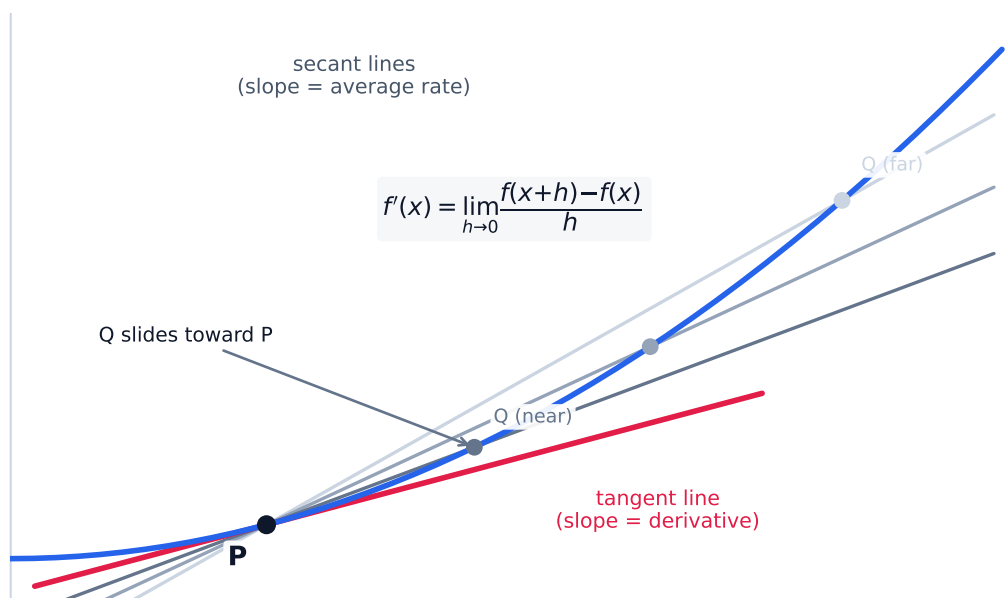
### ■ 1 The slope of a curve

The **derivative** of a function at a point is the **slope of the curve** there – how steep it is at that exact spot.



## ■ 2 From secant to tangent

Take two points on the curve and join them – the **secant line**. Its slope is the **average** rate of change. As the two points move closer together, the secant becomes the **tangent** line, whose slope is the derivative.



## ■ 3 Notation

The derivative of  $f$  is written  $f'(x)$  or  $\frac{dy}{dx}$ .

#### ■ 4 A rate of change

The derivative is a **rate of change**: how fast the output changes as the input changes. For position over time, that rate is the velocity.

**Watch out:** the derivative is the slope of the **tangent** (at a single point), not the secant (between two points). The secant gives the **average** rate of change; the derivative gives the rate at one instant.

### Practice

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Try these in order. The methods are all above.

**2.1** State what the derivative of a function tells you about its graph. [2]

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**2.2** State the difference between a secant line and a tangent line. [2]

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**2.3** State the two common notations for the derivative. [2]

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**2.4** A line has gradient 3. State the derivative of that line at every point. [1]

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**2.5** For an object's position over time, state what its derivative represents. [1]

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