

## 2 The derivative as a slope – Part 1

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

### Vocabulary 词汇

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*Write each word three times. 把每个单词抄写三遍。*

| English    | 中文 | Write it 3 times (English) |
|------------|----|----------------------------|
| derivative | 导数 | _____                      |
| tangent    | 切线 | _____                      |

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### Recall

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

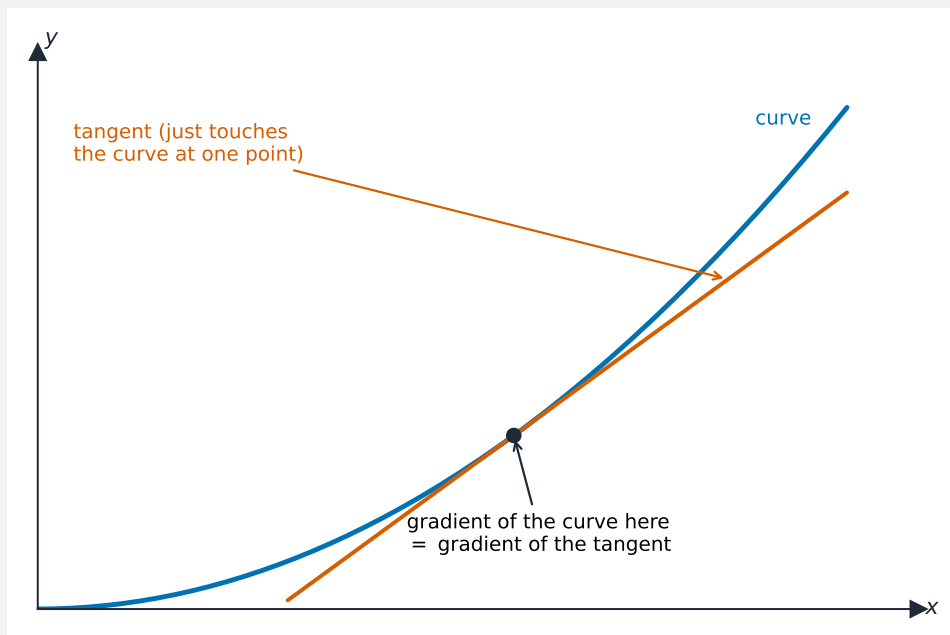
- A steep line has a big gradient; a flat one has zero.
- Gradient = rise over run.
- But a curve's steepness keeps changing along it.

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

### New ideas

#### ■ 1 The slope of a curve

The **derivative** 导数 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** 切线 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

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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