

Exercise walk-through

Defining the Derivative of a Function and Using Derivative Notation ■ 2.2

eXercise

You must be able to

- write the limit definition of the **derivative** 导数
- use the notations $f'(x)$ and $\frac{dy}{dx}$

Method — The derivative

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

is the instantaneous rate of change — the slope of the **tangent line** 切线. Notations:
 $f'(x)$, $\frac{dy}{dx}$, $\frac{d}{dx}[f(x)]$.

Practice 2.1 ■ 1 mark

Write the limit definition of the derivative.

Solution 2.1

Worked steps

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{B1}.$$

Practice 2.2 ■ 1 mark

State two notations for the derivative.

Solution 2.2

Method: The derivative

Worked steps

any two of $f'(x)$, $\frac{dy}{dx}$, $\frac{d}{dx}[f(x)]$ **B1**.

Practice 2.3 ■ 2 marks

State what $f'(x)$ measures geometrically.

Solution 2.3

Worked steps

the slope of the tangent line to the graph of f at x **B1** **B1**.

Exam-style 3.1 ■ 1 mark

The derivative $f'(x)$ is defined as

A $f(x)/x$

B $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

C $f(x) \cdot x$

D $\frac{f(b) - f(a)}{b - a}$ only

Solution 3.1

A $f(x)/x$

B $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$



C $f(x) \cdot x$

D $\frac{f(b) - f(a)}{b - a}$ only

Worked steps

B.

Exam-style 3.2 ■ 1 mark

$\frac{dy}{dx}$ is another notation for the

- A** integral
- B** derivative
- C** limit only
- D** area

Solution 3.2

A integral

B derivative



C limit only

D area

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Answer each.

(a) $f'(a)$ is the slope of the _____ line.

(b) Name the quantity $f'(x)$.

(c) State what $\frac{dy}{dx}$ reads as.

Solution 3.3

Method: The derivative

Worked steps

(a) tangent **B1**. (b) the derivative (instantaneous rate of change) **B1**. (c) the rate of change of y with respect to x **B1**.