# Exercise walk-through

## Defining Continuity at a Point ▪ 1.11

eXercise

## You must be able to

- state the three conditions for **continuity 连续性** at a point
- test continuity using $\lim_{x \to a} f(x) = f(a)$

# Method — Continuity at a point

$f$ is continuous at $a$ when all three hold:

1. $f(a)$ is defined;
2. $\lim_{x \to a} f(x)$ exists;
3. they are equal: $\lim_{x \to a} f(x) = f(a)$.

# Method — Example

If $\lim_{x \to 2} f(x) = 5$ and $f(2) = 5$, then $f$ is continuous at $2$.

## Practice 2.1 ▪ 1 mark

State the three conditions for continuity at $a$.

# Solution 2.1

Method: Continuity at a point

**Worked steps**

$f(a)$ is defined; the limit exists; the limit equals $f(a)$ B1.

## Practice 2.2 ▪ 1 mark

State the single equation summarizing continuity at $a$.

# Solution 2.2

**Worked steps**

$\lim_{x \to a} f(x) = f(a)$ B1.

## Practice 2.3 ▪ 2 marks

If $\lim_{x \to 2} f(x) = 5$ and $f(2) = 5$, is $f$ continuous at $2$?

# Solution 2.3

**Worked steps**

yes — the limit exists, $f(2)$ is defined, and they are equal M1 A1.

## Exam-style 3.1 ▪ 1 mark

$f$ is continuous at $a$ if and only if

**A** $f(a)$ is defined

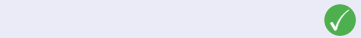
**B** $\lim_{x \to a} f(x) = f(a)$

**C** the limit exists only

**D** $f$ is linear

# Solution 3.1

**A** $f(a)$ is defined

**B** $\lim_{x \to a} f(x) = f(a)$ 

**C** the limit exists only

**D** $f$ is linear

**Worked steps**

**B**.

## Exam-style 3.2 ▪ 1 mark

If $\lim_{x \to a} f(x)$ exists but $\neq f(a)$, then $f$ is

**A** continuous at $a$

**B** discontinuous at $a$

**C** linear

**D** undefined everywhere

# Solution 3.2

**A** continuous at $a$

**B** discontinuous at $a$ ✓

**C** linear

**D** undefined everywhere

**Worked steps**

**B**.

## Exam-style 3.3 ▪ 1 mark

$f(2) = 5$ and $\lim_{x \to 2} f(x) = 5$.
(a) Is $f(2)$ defined?
(b) Does the limit exist?
(c) Is $f$ continuous at $2$?

# Solution 3.3

Method: Continuity at a point

**Worked steps**

(a) yes B1. (b) yes B1. (c) yes B1.