Exercise walk-through

Defining Limits and Using Limit Notation ▪ 1.2

eXercise

You must be able to

- read and write **limit notation 极限记号** $\lim_{x \to a} f(x) = L$
- explain that a limit need not equal $f(a)$

Method — Limit notation

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

means $f(x)$ gets arbitrarily close to L as x approaches a from **both sides** — regardless of the value (or existence) of $f(a)$.

Method — Example

$f(x) = x + 1$: $\lim_{x \to 2} f(x) = 3$, which here also equals $f(2) = 3$.

Practice 2.1 ▪ 1 mark

State what $\lim_{x \to a} f(x) = L$ means.

Solution 2.1

Worked steps

$f(x)$ gets arbitrarily close to L as x approaches a B1.

Practice 2.2 ▪ 1 mark

State whether the limit must equal $f(a)$.

Solution 2.2

Worked steps

no — the limit may differ from $f(a)$ **B1**.

Practice 2.3 ▪ 2 marks

For $f(x) = 2x$, state $\lim_{x \to 3} f(x)$.

Solution 2.3

Worked steps

$\lim_{x\to 3} 2x = 6$ B1 B1.

Exam-style 3.1 ▪ 1 mark

$\lim_{x \to a} f(x) = L$ means $f(x)$ approaches

A a

B L as x approaches a

C infinity

D $f(a)$ always

Solution 3.1

Method: Limit notation

A a

B L as x approaches a ✓

C infinity

D $f(a)$ always

Worked steps

B.

Exam-style 3.2 ▪ 1 mark

The value of a limit

A always equals $f(a)$

B may differ from $f(a)$

C is always 0

D never exists

Solution 3.2

- **A** always equals $f(a)$
- **B** may differ from $f(a)$ ✓
- **C** is always 0
- **D** never exists

Worked steps

B.

Exam-style 3.3 ▪ 1 mark

$f(x) = x + 1$.

(a) State $\lim_{x \to 2} f(x)$.

(b) State $f(2)$.

(c) State whether they agree.

Solution 3.3

Worked steps

(a) 3 **B1**. (b) 3 **B1**. (c) yes **B1**.