

Exercise walk-through

Determining Limits Using Algebraic Properties of Limits ■ 1.5

eXercise

You must be able to

- apply the **limit laws** 极限律 (sum, product, constant multiple)
- use **direct substitution** 直接代入 for continuous functions

Method — Limit laws

Limits distribute over sums, differences, products, quotients (denominator $\neq 0$), and constant multiples. For a continuous function, $\lim_{x \rightarrow a} f(x) = f(a)$ (**direct substitution**).

Method — Example

$$\lim_{x \rightarrow 3} (x^2 - 1) = 3^2 - 1 = 8.$$

Practice 2.1 ■ 1 mark

State the limit of a sum $\lim(f + g)$.

Solution 2.1

Worked steps

$$\lim f + \lim g \quad \text{B1}.$$

Practice 2.2 ■ 2 marks

Evaluate $\lim_{x \rightarrow 2} (3x + 1)$ by substitution.

Solution 2.2

Worked steps

$$3(2) + 1 = 7 \quad \text{M1} \quad \text{A1}.$$

Practice 2.3 ■ 1 mark

State when direct substitution works.

Solution 2.3

Method: Limit laws

Worked steps

when the function is continuous at a **B1**.

Exam-style 3.1 ■ 1 mark

$\lim(f + g)$ equals

A $\lim f \cdot \lim g$

B $\lim f + \lim g$

C $\lim f - \lim g$

D $f(a)$

Solution 3.1

A $\lim f \cdot \lim g$

B $\lim f + \lim g$ 

C $\lim f - \lim g$

D $f(a)$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

For a continuous function, $\lim_{x \rightarrow a} f(x)$ equals

A 0

B $f(a)$

C ∞

D a

Solution 3.2

Method: Limit laws

A 0

B $f(a)$



C ∞

D a

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Evaluate $\lim_{x \rightarrow 3}(x^2 - 1)$.

- (a) Substitute $x = 3$.
- (b) Compute 3^2 .
- (c) State the limit.

Solution 3.3

Worked steps

(a) $3^2 - 1$ **B1**. (b) 9 **B1**. (c) 8 **B1**.