

1.5 Determining Limits Using Algebraic Properties of Limits

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **determining limits using algebraic properties of limits**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ 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**).

■ Example

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

2 Practice

2.1 State the limit of a sum $\lim(f + g)$. [1]

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

2.3 State when direct substitution works. [1]

3 Exam-style questions

3.1 $\lim(f + g)$ equals [1]

- **A** $\lim f \cdot \lim g$
 - **B** $\lim f + \lim g$
 - **C** $\lim f - \lim g$
 - **D** $f(a)$
-

3.2 For a continuous function, $\lim_{x \rightarrow a} f(x)$ equals [1]

- **A** 0
 - **B** $f(a)$
 - **C** ∞
 - **D** a
-

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

(a) Substitute $x = 3$. [1]

(b) Compute 3^2 . [1]

(c) State the limit. [1]

4 Go further

- work through the **1.5 Determining Limits Using Algebraic Properties of Limits** lesson on the **Learn** page;
- read the **Limits and Continuity** section of the AP Calculus AB handout on the **Know** page.

Solutions

2.1 $\lim f + \lim g$.

2.2 $3(2) + 1 = 7$.

2.3 when the function is continuous at a .

3.1 B.

3.2 B.

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