

2.7 Composition of Functions

Name: _____ Class: _____ Date: _____ Total: 9 marks

KEY WORDS composite function 复合函数

Objective

Build the skills to answer exam questions on **composition of functions**.

You must be able to:

- evaluate a **composite function** 复合函数 $(f \circ g)(x) = f(g(x))$
- apply the inner function first, then the outer

1 Worked examples

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

■ **Composite functions**

$(f \circ g)(x) = f(g(x))$ — apply g **first**, then feed the result into f .

■ **Example**

$f(x) = x + 1$, $g(x) = x^2$:

$(f \circ g)(x) = x^2 + 1$, while $(g \circ f)(x) = (x + 1)^2$ — order matters.

2 Practice

2.1 State what $(f \circ g)(x)$ means. [1]

2.2 For $f(x) = x + 2$ and $g(x) = 3x$, find $(f \circ g)(x)$. [2]

2.3 For the same functions, find $(g \circ f)(x)$. [1]

3 Exam-style questions

3.1 $(f \circ g)(x)$ means [1]

- A $f(x) \cdot g(x)$
- B $f(g(x))$
- C $g(f(x))$
- D $f(x) + g(x)$

3.2 In a composition, you apply the [1]

- A outer function first
- B inner function first
- C both at once
- D neither

3.3 $f(x) = 2x$, $g(x) = x - 1$.

(a) Find $(f \circ g)(x)$. [1]

(b) Find $(g \circ f)(x)$. [1]

(c) Evaluate $(f \circ g)(4)$. [1]

Solutions

2.1 apply g first, then f : $f(g(x))$.

2.2 $(f \circ g)(x) = 3x + 2$.

2.3 $(g \circ f)(x) = (x + 2) \cdot 3 = 3x + 6$.

3.1 B.

3.2 B.

3.3 (a) $2(x - 1) = 2x - 2$. (b) $2x - 1$. (c) $2(4 - 1) = 6$.