AP CALCULUS AB • EXERCISE SHEET

# 1.9 Connecting Multiple Representations of Limits

Name: _____ Class: _____ Date: _____ **Total: 12 marks**

**KEY WORDS** algebra • graph • table • limit • approaches

## Objective

Build the skills to answer exam questions on **connecting multiple representations of limits**.

**You must be able to:**

- find a limit from a graph, a table, or algebra
- cross-check that the three representations agree

## 1 Key knowledge and worked examples

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

**■ Multiple representations**

A limit can be found from a **graph** , a **table** , or **algebra** – and all three should give the same value. Cross-check when unsure.

**■ Example**

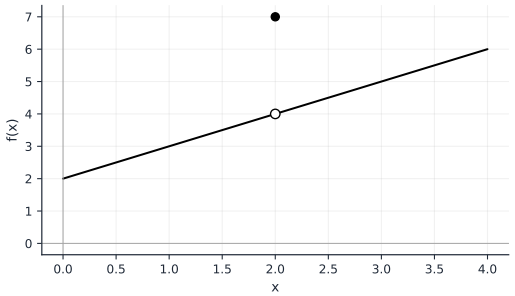
If algebra gives $\lim = 5$, the table trend is $\to 5$, and the graph approaches 5, the limit is 5.

**■ Key knowledge: Connect algebra, graph and value**

The formula for nearby inputs can determine the limit, while a separate point definition determines the actual value. A table should agree with that nearby formula.

**■ Worked example: Connect algebra, graph and value**

For $x \neq 2$, $(x^2 - 4)/(x - 2) = x + 2$. Nearby values therefore approach 4, and the graph follows the line $y = x + 2$ with a hole at $(2, 4)$. If a separate definition assigns $f(2) = 7$, the filled point is $(2, 7)$; that assignment changes continuity but not the limit.




## 2 Practice

**2.1** Name three ways to find a limit. [1]

**2.2** State what should be true across the representations. [1]

**2.3** If algebra gives 5 and the table trend is 5, state the limit. [1]

## 3 Exam-style questions

**3.1** A limit can be represented by [1]

☐ **A** only a graph
**B** a graph, table, or algebra
**C** only algebra
**D** none of these

**3.2** The three representations of a limit should [1]

☐ **A** conflict
**B** all agree
**C** give different values
**D** be ignored

**3.3** For a function, algebra gives $\lim = 4$, the table trend is $\to 4$, and the graph approaches 4.

(a) State the value from algebra. [1]

(b) State whether they agree. [1]

(c) State the limit. [1]

**3.4** Let $g(x) = (x^2 - 9)/(x - 3)$ for $x \neq 3$ and $g(3) = 9$. (a) Find the limit at 3 by algebra. [2]

(b) State the open and filled point coordinates at $x = 3$ and decide whether $g$ is continuous there. [2]