AP CALCULUS BC • EXERCISE SHEET

# 1.2 Defining Limits and Using Limit Notation

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

## Objective

Build the skills to answer exam questions on **defining limits and using limit notation**.

**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 $f(a)$

## 1 Worked examples

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

■ **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 $f(a)$.

■ **Example**

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

## 2 Practice

**2.1** State what $\lim_{x\to a} f(x) = L$ means. [1]

**2.2** State whether the limit must equal $f(a)$. [1]

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

## 3 Exam-style questions

**3.1** $\lim_{x \to a} f(x) = L$ means $f(x)$ approaches [1]

- **A** $a$
- **B** $L$ as $x$ approaches $a$
- **C** infinity
- **D** $f(a)$ always

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**3.2** The value of a limit [1]

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

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**3.3** $f(x) = x + 1$.

(a) State $\lim_{x \to 2} f(x)$. [1]

(b) State $f(2)$. [1]

(c) State whether they agree. [1]

## 4 Go further

- work through the **1.2 Defining Limits and Using Limit Notation** lesson on the **Learn** page;
- read the **Limits and Continuity** section of the AP Calculus BC handout on the **Know** page.

## Solutions

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

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

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

**3.1 B**.

**3.2 B**.

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