

# 1.13 Removing Discontinuities

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 9 marks

## Objective

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Build the skills to answer exam questions on **removing discontinuities**.

**You must be able to:**

- remove a **removable discontinuity** 可去间断点 by redefining  $f$  at the hole

## 1 Worked examples

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

### ■ Removing a discontinuity

A removable discontinuity (a hole) can be removed by defining  $f(a) = \lim_{x \rightarrow a} f(x)$ .

### ■ Example

$f(x) = \frac{x^2 - 4}{x - 2}$  has a hole at  $x = 2$ ; since the limit there is 4, setting  $f(2) = 4$  makes  $f$  continuous.

## 2 Practice

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**2.1** State how to remove a removable discontinuity. [1]

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**2.2** For  $f(x) = \frac{x^2 - 4}{x - 2}$ , find the value that removes the hole at 2. [2]

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**2.3** State which kind of discontinuity can be removed. [1]

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### 3 Exam-style questions

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3.1 A removable discontinuity is removed by setting  $f(a)$  equal to [1]

- A 0
  - B the limit at  $a$
  - C  $f(a + 1)$
  - D  $\infty$
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3.2 Which discontinuity can be removed? [1]

- A jump
  - B infinite
  - C removable
  - D none
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3.3  $f(x) = \frac{x^2 - 9}{x - 3}$ , with a hole at 3.

(a) Simplify  $f$ . [1]

(b) Find the limit at 3. [1]

(c) State  $f(3)$  to remove the hole. [1]

### 4 Go further

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- work through the **1.13 Removing Discontinuities** lesson on the **Learn** page;
- read the **Limits and Continuity** section of the AP Calculus BC handout on the **Know** page.

## Solutions

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**2.1** define  $f(a)$  to equal the limit  $\lim_{x \rightarrow a} f(x)$ .

**2.2** the limit is 4, so set  $f(2) = 4$ .

**2.3** a removable discontinuity (a hole).

**3.1 B.**

**3.2 C.**

**3.3** (a)  $x + 3$  (for  $x \neq 3$ ). (b) 6. (c)  $f(3) = 6$ .