

1.11 Defining Continuity at a Point

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **defining continuity at a point**.

You must be able to:

- state the three conditions for **continuity** 连续性 at a point
- test continuity using $\lim_{x \rightarrow a} f(x) = f(a)$

1 Worked examples

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

■ Continuity at a point

f is continuous at a when all three hold:

1. $f(a)$ is defined;
2. $\lim_{x \rightarrow a} f(x)$ exists;
3. they are equal: $\lim_{x \rightarrow a} f(x) = f(a)$.

■ Example

If $\lim_{x \rightarrow 2} f(x) = 5$ and $f(2) = 5$, then f is continuous at 2.

2 Practice

2.1 State the three conditions for continuity at a . [1]

2.2 State the single equation summarizing continuity at a . [1]

2.3 If $\lim_{x \rightarrow 2} f(x) = 5$ and $f(2) = 5$, is f continuous at 2? [2]

3 Exam-style questions

3.1 f is continuous at a if and only if [1]

- **A** $f(a)$ is defined
 - **B** $\lim_{x \rightarrow a} f(x) = f(a)$
 - **C** the limit exists only
 - **D** f is linear
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3.2 If $\lim_{x \rightarrow a} f(x)$ exists but $\neq f(a)$, then f is [1]

- **A** continuous at a
 - **B** discontinuous at a
 - **C** linear
 - **D** undefined everywhere
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3.3 $f(2) = 5$ and $\lim_{x \rightarrow 2} f(x) = 5$.

- (a) Is $f(2)$ defined? [1]
- (b) Does the limit exist? [1]
- (c) Is f continuous at 2? [1]

4 Go further

- work through the **1.11 Defining Continuity at a Point** lesson on the **Learn** page;
- read the **Limits and Continuity** section of the AP Calculus BC handout on the **Know** page.

Solutions

2.1 $f(a)$ is defined; the limit exists; the limit equals $f(a)$.

2.2 $\lim_{x \rightarrow a} f(x) = f(a)$.

2.3 yes —the limit exists, $f(2)$ is defined, and they are equal.

3.1 B.

3.2 B.

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