1.2 / Limit Notation

Watch the lesson ➤

Read and write a limit statement and distinguish it from a function value

Learning goal

Read, write, and interpret a limit statement, and distinguish the limit from the value at a point.

Key ideas

01 In $\lim_{x \to a} f(x) = L$, the part under the limit sign tells where x goes, $f(x)$ is the function, and L tells where the outputs go.

02 As x approaches a, use values of x near a from both sides with $x \neq a$.

03 The same height L must be approached from both sides.

04 $f(a)$ describes the value at a. The limit uses nearby inputs, so the value at a may differ or be undefined.

Remember

limit
The real number L that $f(x)$ approaches as x gets close to a from both sides, with $x \neq a$.

approach
The input gets closer to the specified value.

function value
The output $f(a)$ when the input is exactly a.

Three parts of a limit statement

$$\lim_{x \to a} f(x) = L$$

Class notes

1.2 / Write it clearly

What earns the point on the AP Exam, and the mistakes that lose it.

Writing checklist

Notation to use and to avoid

WRITE	AVOID
Write the whole statement: the approach, the function, and the value, as in $\lim_{x \to 3} f(x) = 7$.	Do not leave out the function: $\lim_{x \to 3} = 7$ and "lim = 7" are incomplete. Do not write $f(3) = 7$ when you mean $\lim_{x \to 3} f(x) = 7$. They are different statements.

Common mistakes

The mistake code is used in the answers and in My Mistakes

01 The limit is not always the value

Code L2

✗ $\lim_{x \to 4} h(x) = 6$, so $h(4) = 6$.	✓ The limit uses inputs near 4. The value $h(4)$ is a separate fact and may be undefined.

Real AP questions on this topic Free on AP Central. Try them after the practice.

Limit notation appears throughout AP limit questions. No released FRQ tests reading limit notation alone.

1.2 / Guided examples

Watch, pause, and write the reasoning. Full solutions are in the video.

Problem types

Read the problem, name the type, then use its method

Type	Method	Problems
Read, write, and interpret limit notation	Locate the input under the limit sign, the function next, and the output after the equals sign.	E01 · Practice 2
Near versus at — the limit and the value f(c)	Use values near a for the limit. Read $f(a)$ separately at $x = a$.	E02 · Practice 1, 3

Example 01

Video · E01

As x gets closer and closer to -1 (but $x \neq -1$), $f(x)$ gets closer and closer to 5.
Which is written correctly?

A. $\lim_{x \to 5} f(x) = -1$
B. $\lim_{x \to -1} f(x) = 5$
C. $\lim f(x) = 5$
D. $\lim_{x \to -1} = 5$

> Write where the input goes under the limit sign and where the output goes after the equals sign.

Example 02

Video · E02

It is known that $\lim_{x \to 4} f(x) = 6$. Which must be true?
(I) $f(4) = 6$ (II) $f(4)$ is defined.
(III) $f(x)$ is as close to 6 as we like for x near 4, $x \neq 4$.

A. (I) only
B. (III) only
C. (I) and (III) only
D. (I), (II), and (III)

> Does a limit say anything about $f(4)$?

VIDEO COMPLETE Check your example answers at the end of this booklet.

1.2 / Example answers

Limit Notation

E01 (B)

E02 (B)