

Definition of the limit

Definition

Let f be a function defined for all values of x in an open interval containing a , except possibly at a . We say that the **limit of $f(x)$ as x approaches a is L** , and write

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

if we can make the value of $f(x)$ arbitrarily close to L by choosing x sufficiently close (but not equal) to a .

Note: limits are all about how the value of $f(x)$ is *trending*.

Exploring the definition of the limit:

<https://www.geogebra.org/m/nwAS4XFS>

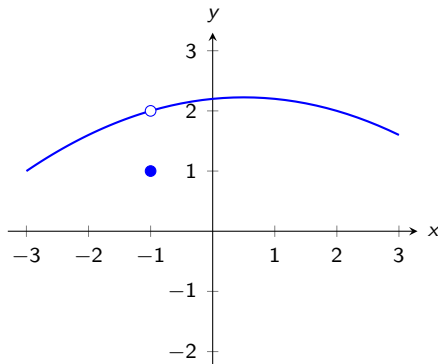
Concept of the limit

Question

The graph of a function f is shown.

True or false? $\lim_{x \rightarrow -1} f(x) = 2.$

- A True, and I'm sure
- B True, but I'm not sure
- C False, but I'm not sure
- D False, and I'm sure



Limit properties

Provide all limits below exist,

$$\lim_{x \rightarrow a} (f(x) + g(x)) = \lim_{x \rightarrow a} f(x) + \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} (kf(x)) = k \lim_{x \rightarrow a} f(x) \quad \text{for any constant } k$$

$$\lim_{x \rightarrow a} (f(x)g(x)) = \lim_{x \rightarrow a} f(x) \cdot \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} x = a$$