Mariana Gonzalez

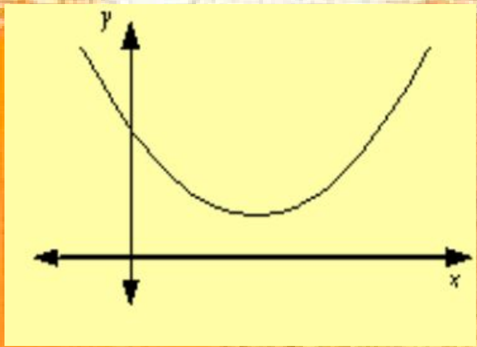
Sofía Zubieta

DISCONTINUITY

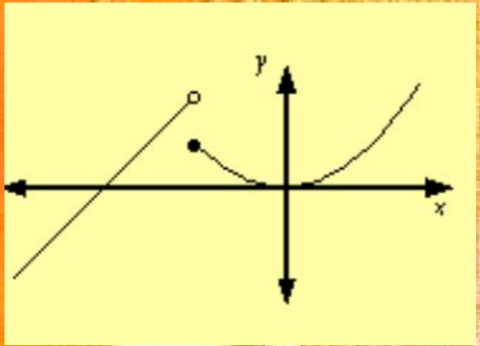
What is a discontinuity?

- A function with a graph that is not connected.
- Discontinuities can be classified as *jump, infinite, removable, endpoint, or mixed*

Continued Graph



Discontinuity Graph

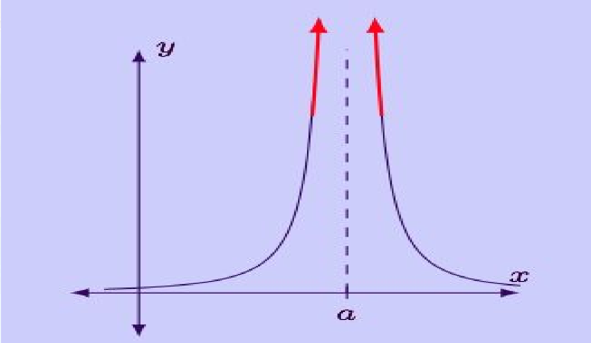


TYPES OF DISCONTINUITY

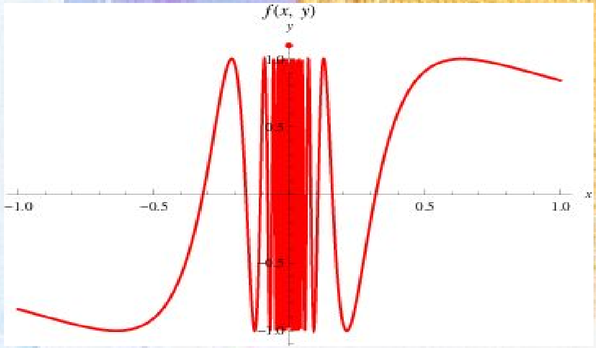
1. Infinite Discontinuity

- The arrows on the function indicate it will grow infinitely large as *x* approaches *a, the asymptote.* Since the function doesn't approach a particular finite value, the limit does not exist. This is an <u>infinite discontinuity.</u>
- In example 2, a function for which both lim_(x->0-)f(x) and lim_(x->0+)f(x) fail to exist. In particular, f has an infinite discontinuity at x=0.

This graph is discontinued at x=a



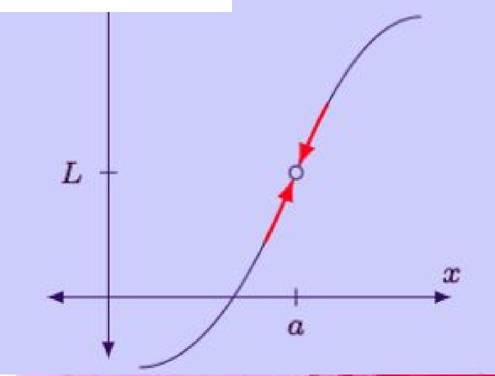
Example 2



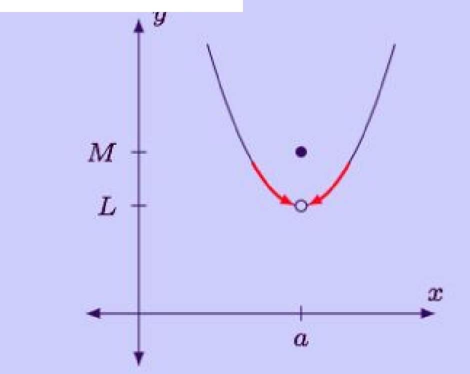
2. Removable discontinuities

- In the graph, there is a hole in the function at x=a. These holes are called <u>removable discontinuities.</u>
- Even though there are holes at *x=a*, the limit value at *x=a* exists.

Example 1



Example 2



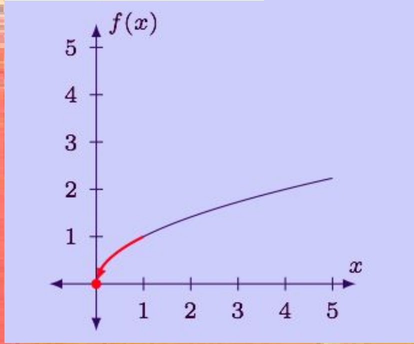
3. Endpoint Discontinuities

When a function is defined on an interval with a closed endpoint, the limit cannot exist at that endpoint. This is because the limit has to examine the function values as x approaches from both sides.

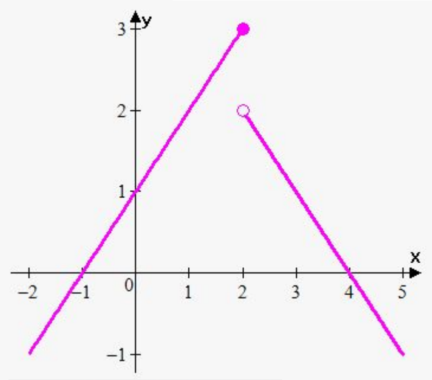
On example 1; x=0 is the left-endpoint of the functions domain: [0,∞) and the function is technically not continuous there because the limit doesn't exist (because xx can't approach from both sides). f(x)=x2+2x−3x−1

On example two we can observe how we have two different endpoints, one opened and one closes meaning the limit does not exist, having an endpoint discontinuity

Example 1

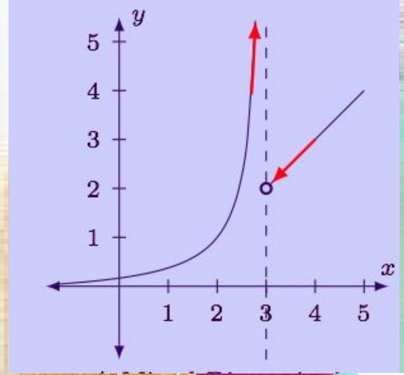


Example 2

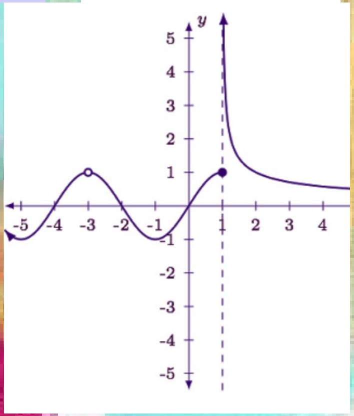


$$f(x) = \begin{cases} x+1 & \text{if } x \leq 2 \\ 4-x & \text{if } x > 2 \end{cases}$$

Example 1



Example 2



4. Mixed Discontinuities

The function of Example 1 is discontinuous at x=3. From the left, the function has an infinite discontinuity, but from the right, the discontinuity is removable. *Since there is more than one reason why the discontinuity exists*, we say this is a <u>mixed discontinuity.</u> In example number two we can see how the two function mix

APA

- What are the types of Discontinuities? (n.d.). Retrieved August 29, 2017, from http://www.mathwarehouse.com/calculus/continuity/what-are-types-of-discontinuities.php