DISCONTINUITY

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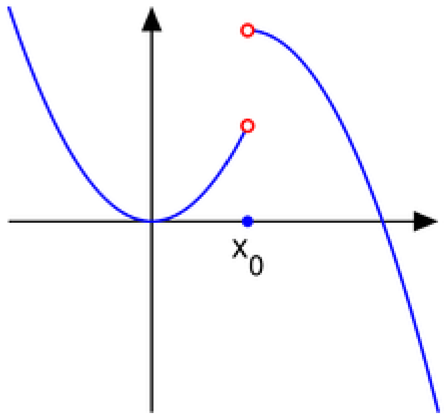
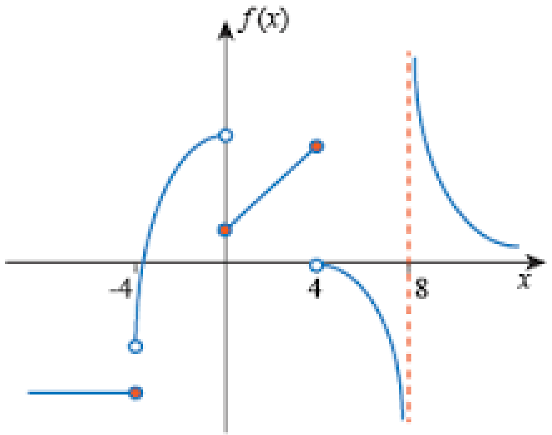
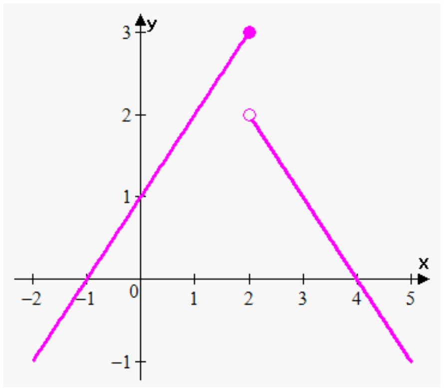
WHAT IS A DISCONTINUITY????

In Common language we refer to discontinuity when there is disruption in the normal structure or configuration of system, well in math it is the same concept but applied to functions and their corresponding graphs.

In math discontinuity is when in a function you have certain value or values where the variables do not vary continuously. In a discontinuity you may have abrupt changes between values, in its law of variation or in some cases the function might become imaginary.



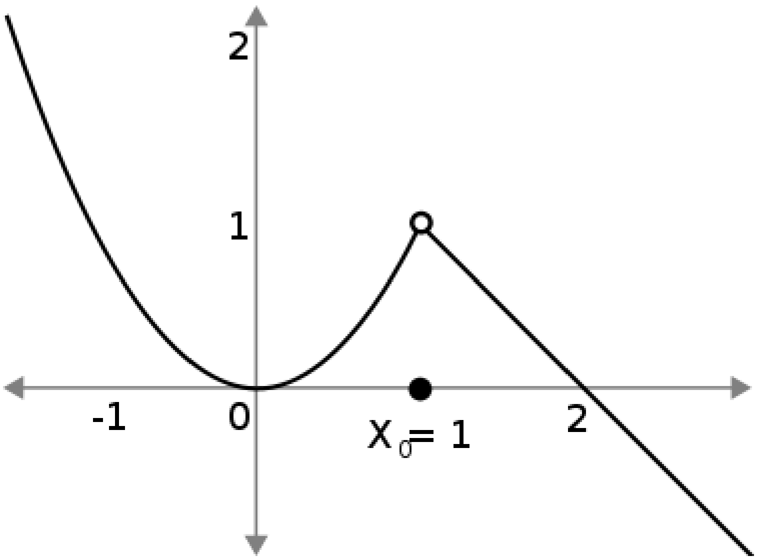


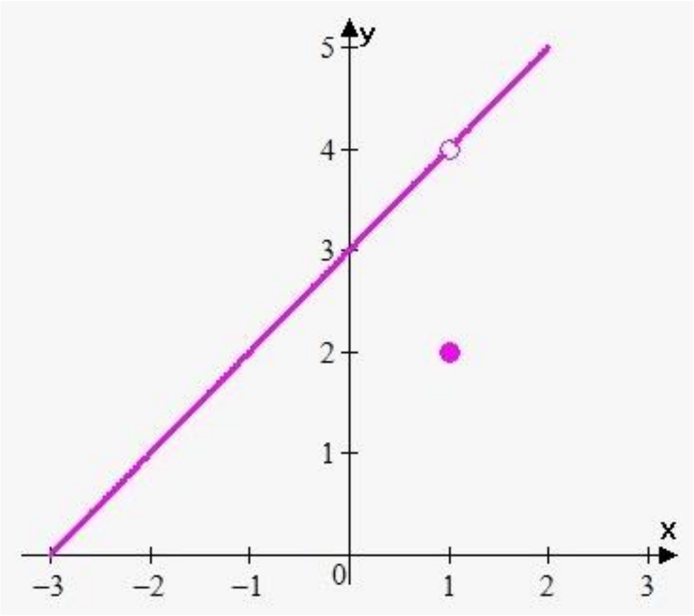


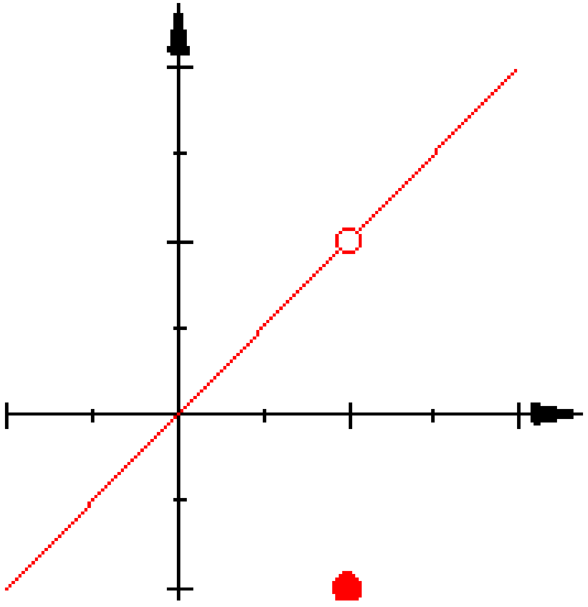
TYPES OF DICONTINUITIES

POINT OR REMOVABLE DISCONTINUITY

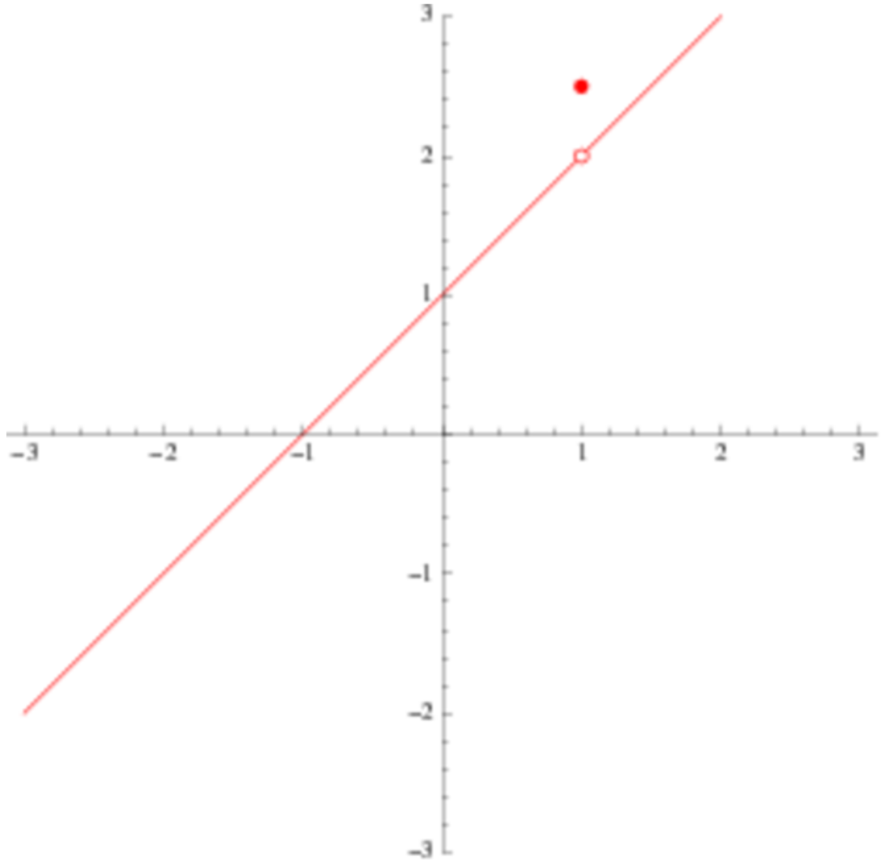
in this type of graph there exists a limit and they can also be fixed by redefining the function of the graph. the holes in the functions are the ones called removable discontinuities and even though there is a hole, the limit is still where the hole is supposed to be







$$f(x) = \begin{cases} \dfrac{x^2 - 1}{x - 1} & \text{for } x \neq 1 \\ 5/2 & \text{for } x = 1, \end{cases}$$

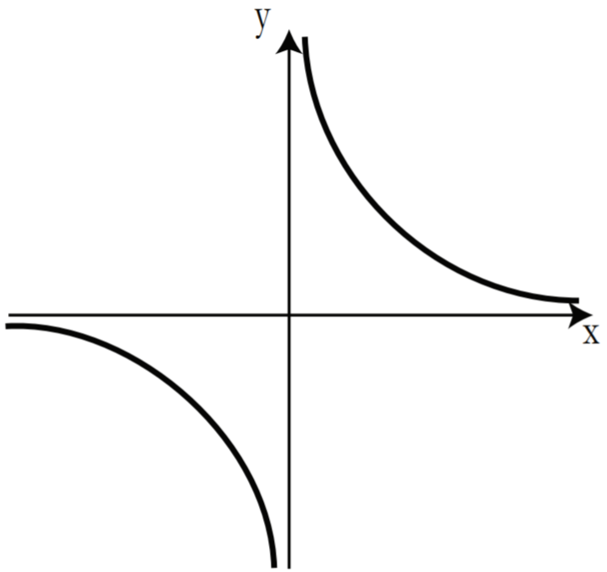


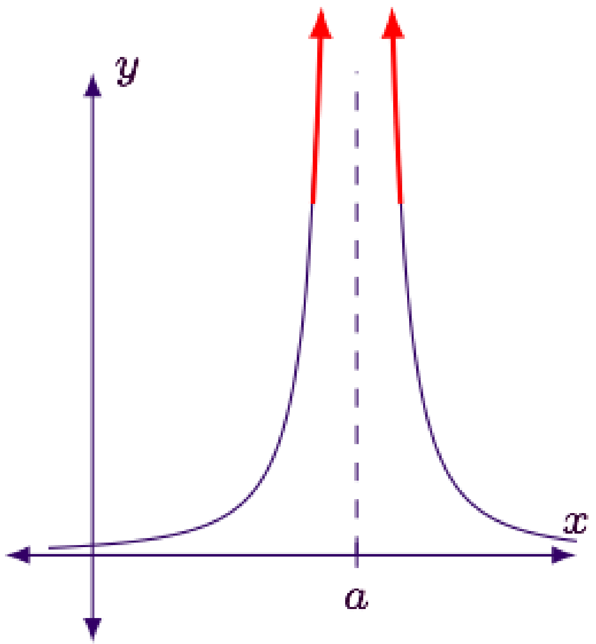
Expand the term on the nominator to have (x-1)(x+1) and then cancel x-1 with the one on the denominator, this means you have a hole at x=1.

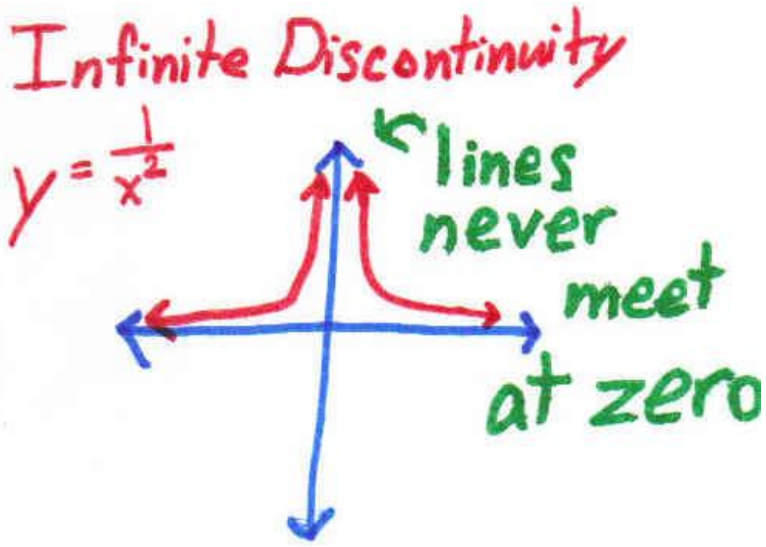
The second equation states that the previous formula has no continuous value at x=1, so for the value x=1 the y value will be at 5/2.

INFINITY DICONTINUITY

both side limits of the graph exist and are infinite, the arrows of the function tells that the graph is infinite because x will always try to approach a value and it will get closer but it never touches, since the function doesn't approaches a particular finite value, the limit does not exist. this is an infinite discontinuity

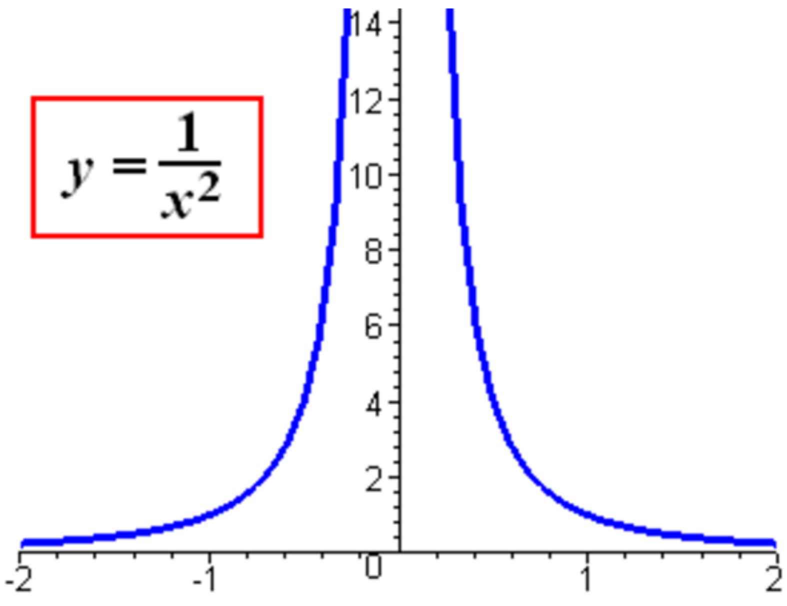






For example in the equation $\frac{1}{x^2}$

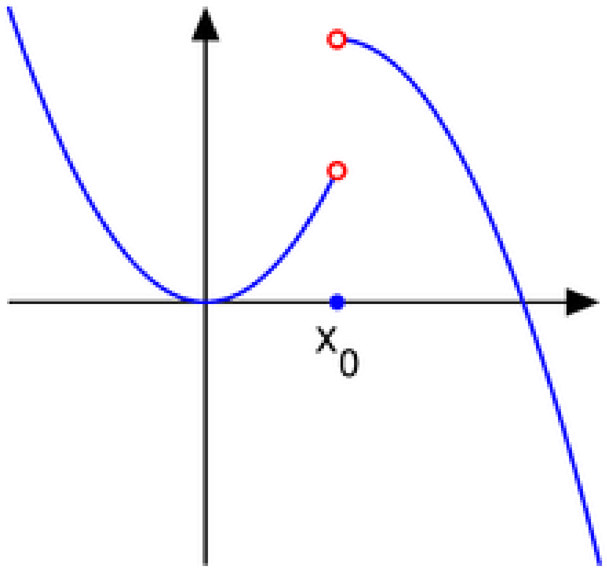
We can observe that the equation reaches positive infinite from both sides, yet it will reach numbers very close to 0, yet never touch it .

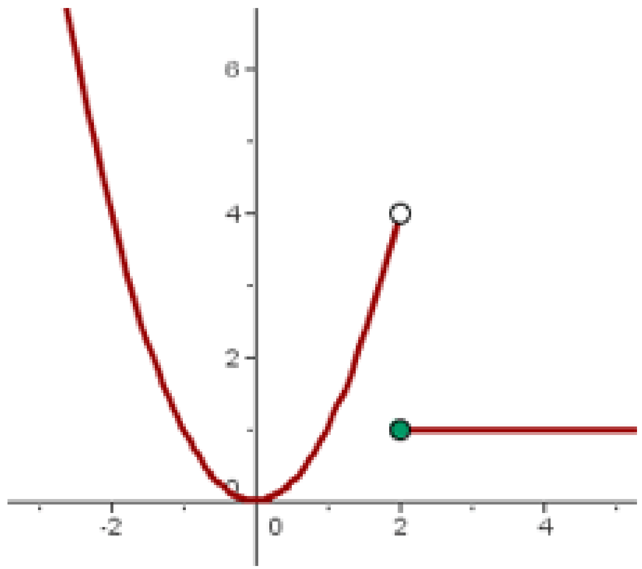


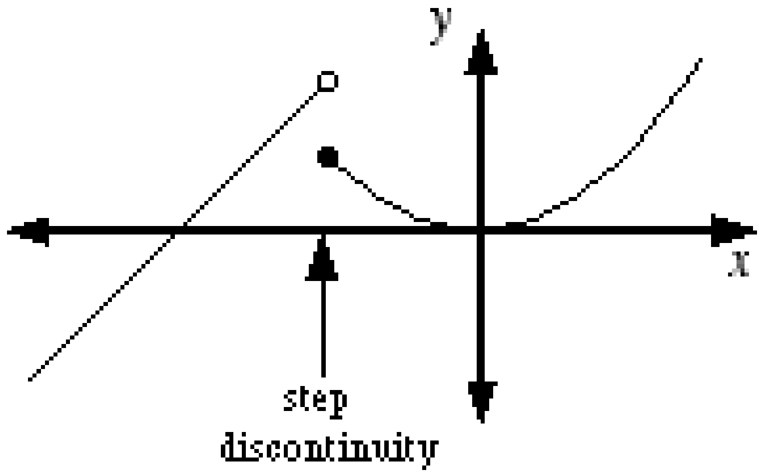
Infinite discontinuity at 0.

JUMP

both side limits of the graph exist but they have different values, the graphs approach different values depending on the direction x is coming from and when that happen it is called a jump discontinuity at x=n

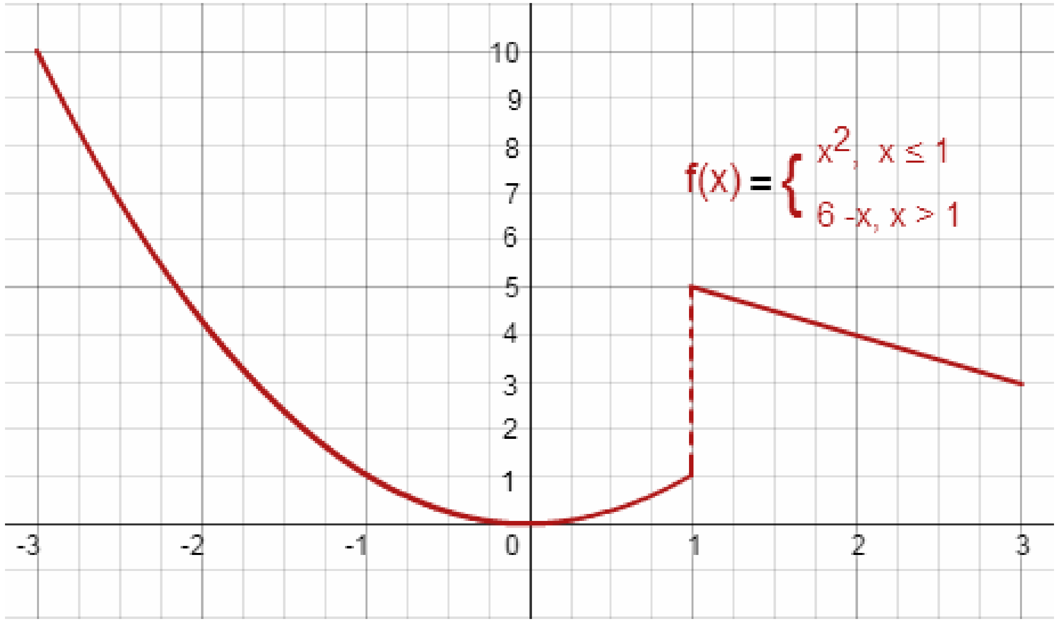






For instance

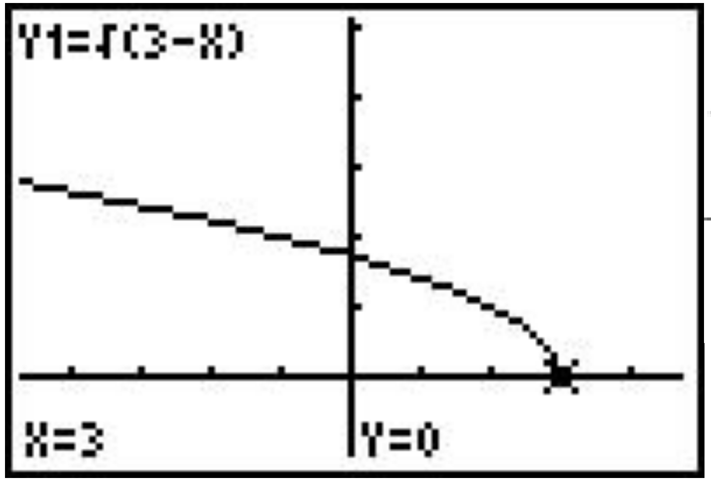
limx⟶a−f(x)=L and limx⟶a+f(x)=M.
We can observe that values reaching 1
From the negative side approach 1 and
Values coming from the positive side
Approach 5.

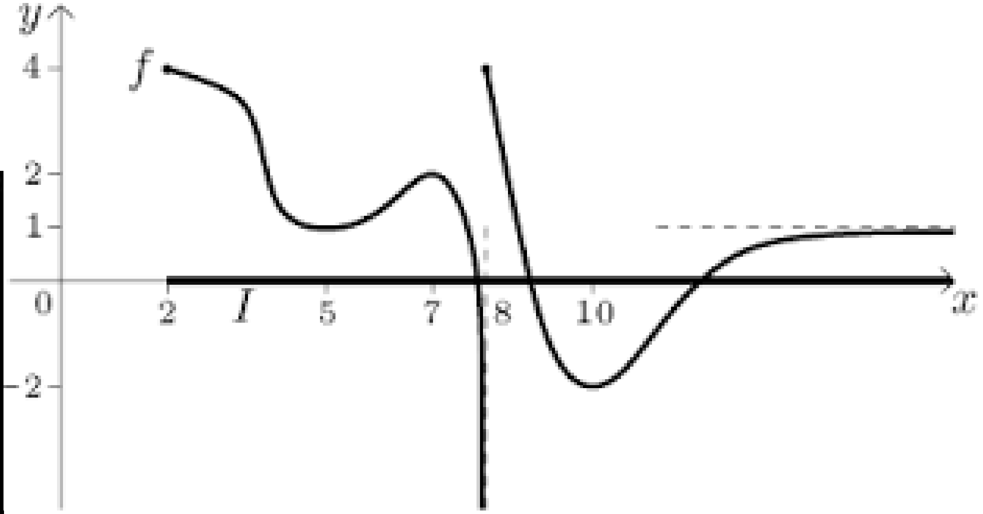


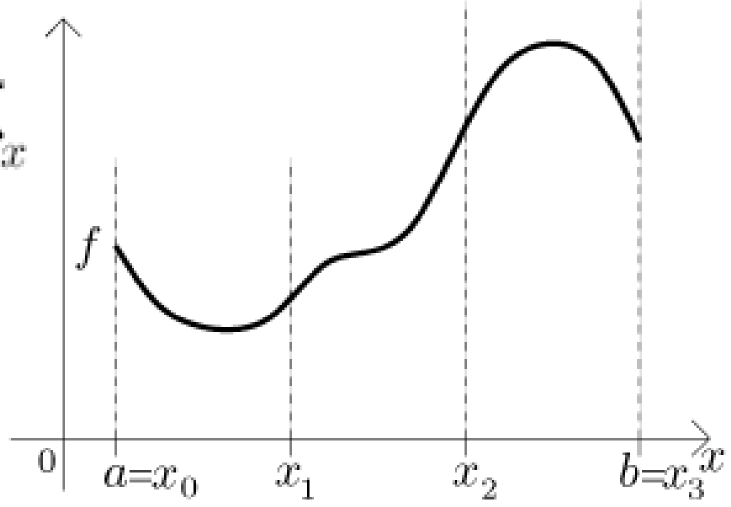
They are very similar to removable discontinuities , yet their limits differ according to the side of the equation, thereforethe limit doesn´t exisit.

ENDPOINT DISCONTINUITY

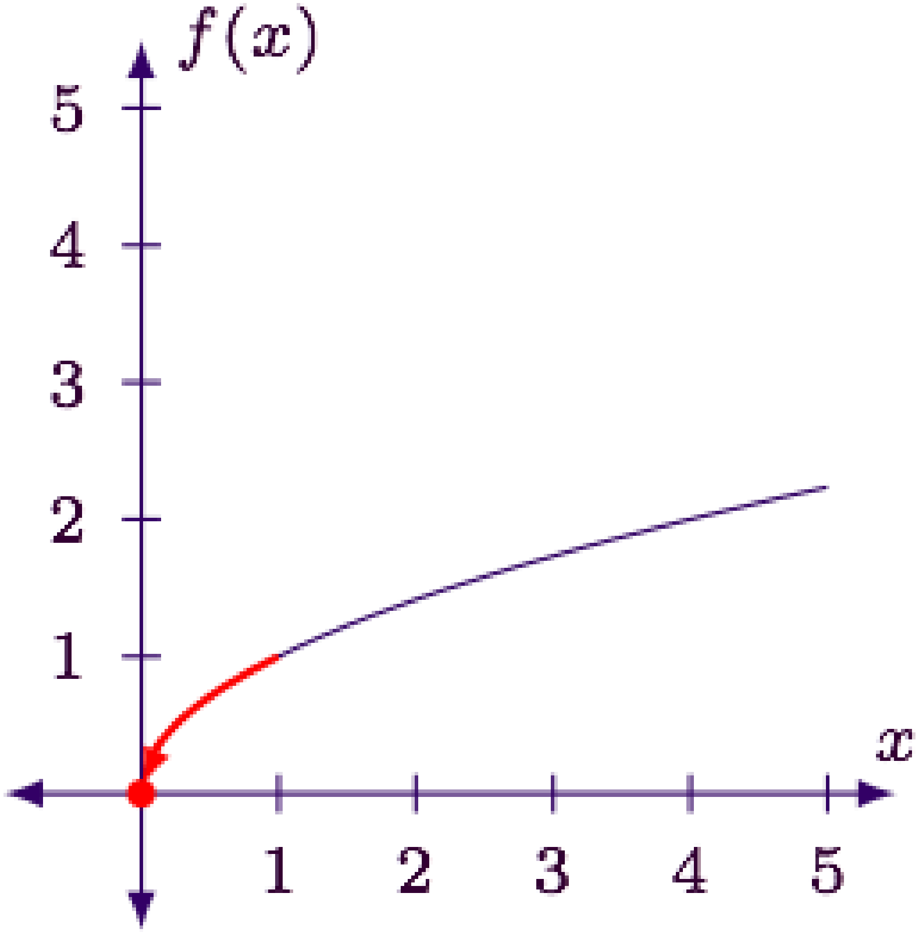
only one side of the limits exist, this happens when the function is defined with a closed endpoint and because of this there is a limit only on one side and the limit cannot exist at the endpoint because the limit needs to examine the function at both sides of the function approaching the x value





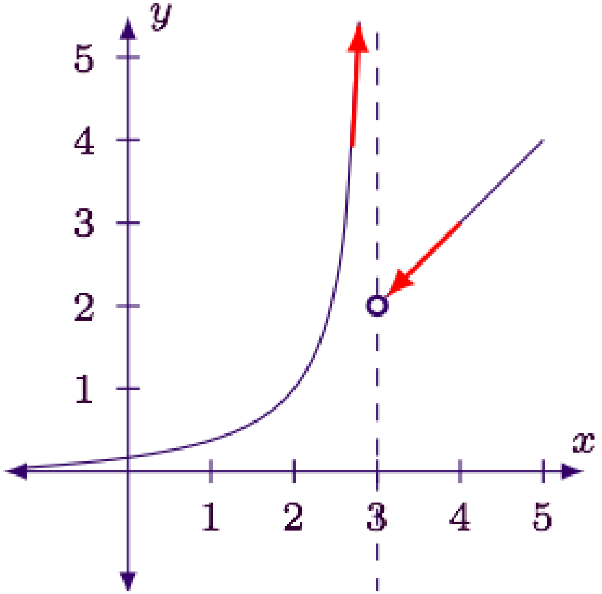


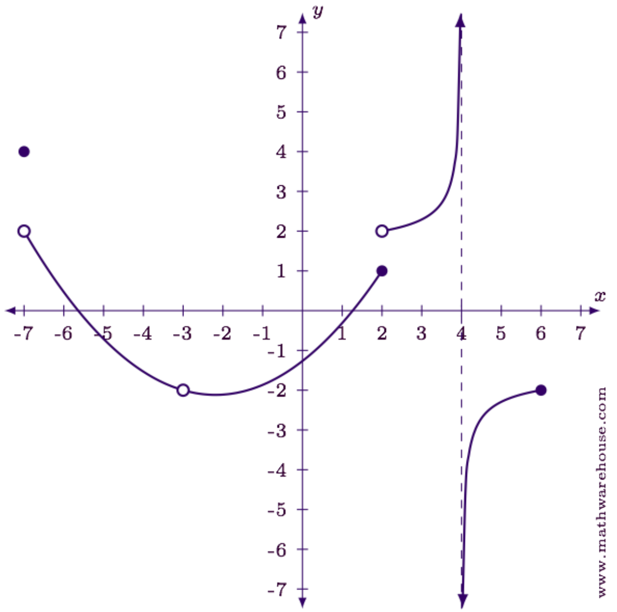
As we can see in the graph the graph continues towards the positive side, yet it does not have a negative side, so we conclude it has a "dead end" that leads nowhere.

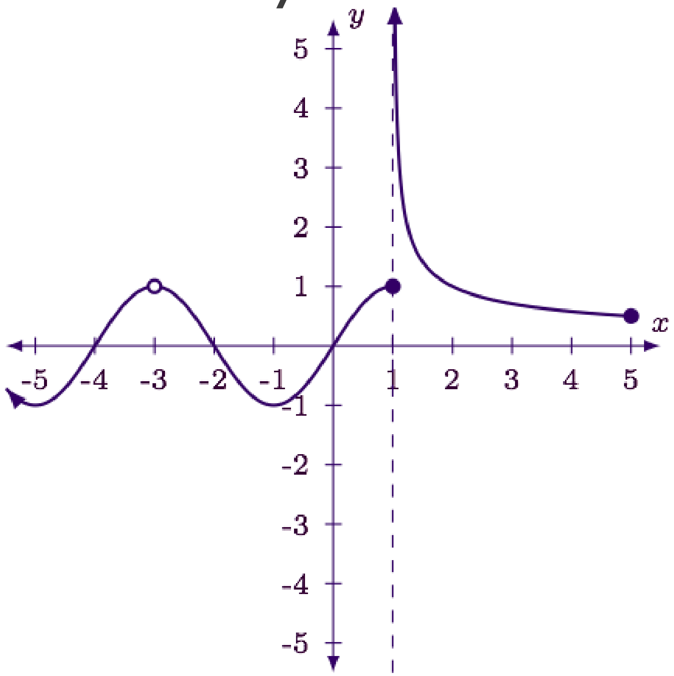


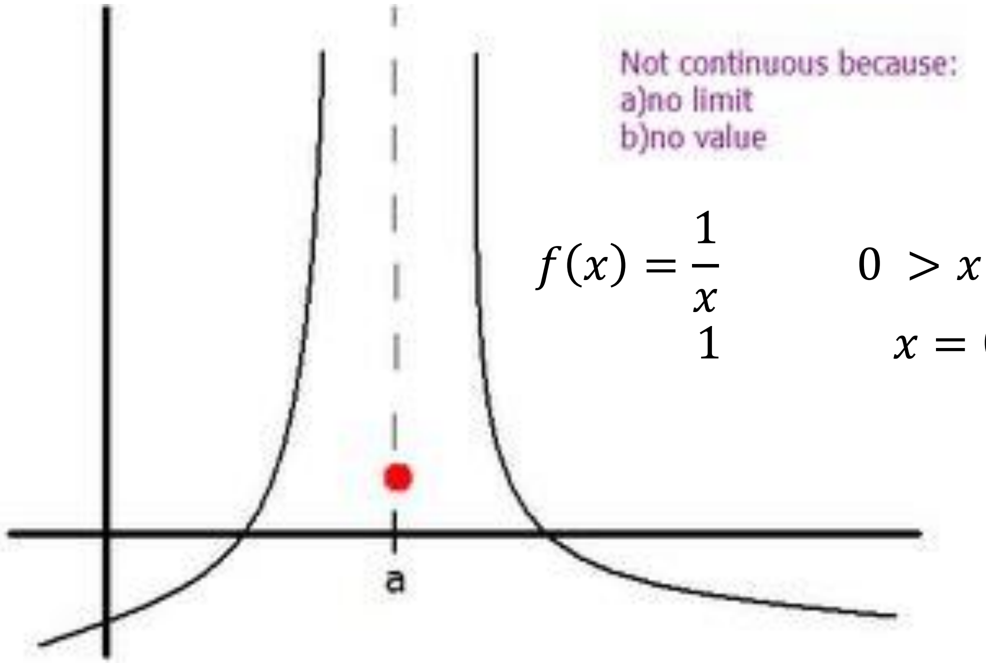
MIXED DISCONTINUITY

Always at least one of the limits does not exist, usually it has one infinite discontinuity in one side and at the other side it has a removable discontinuity and because there is more than one reason this discontinuity exist, it is called mixed discontinuity









$$f(x) = \frac{1}{x} \qquad 0 > x > 0$$

$$1 \qquad x = 0$$

In this case for example we can see that we have an infinite discontinuity because the limit approaches positive infinite from both sides yet they never touch 0, but we also have a jump discontinuity.

APA

- Discontinuous function. (n.d.). Retrieved August 29, 2017, from http://www.thefreedictionary.com/Discontinuous function
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