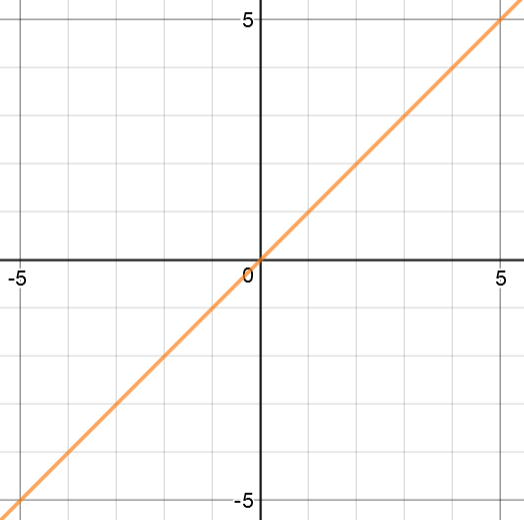
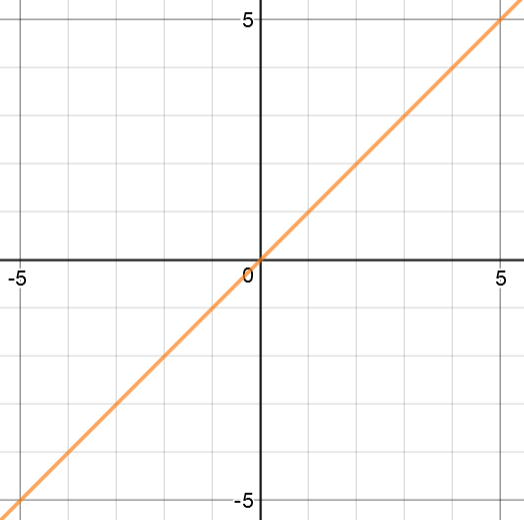
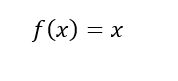
## What is Continuity?

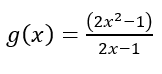
In general terms, continuity is when a function has *no gaps, holes, or breaks*. There are three different types of continuity however.

## 3 Types of Continuity?

At a point

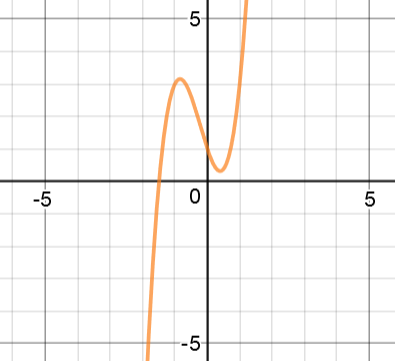
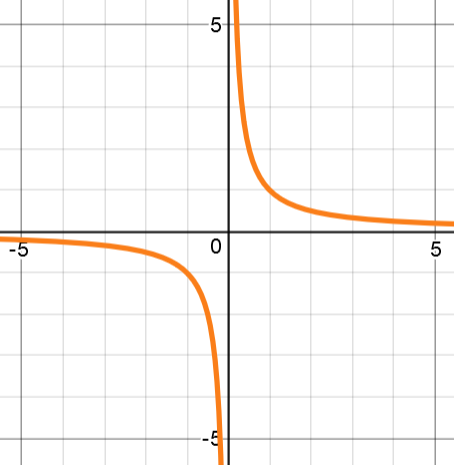
is continuous at is not continuous at

because is not defined

For f to be continuous at ,

* must be defined
* exists

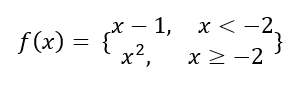
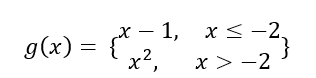
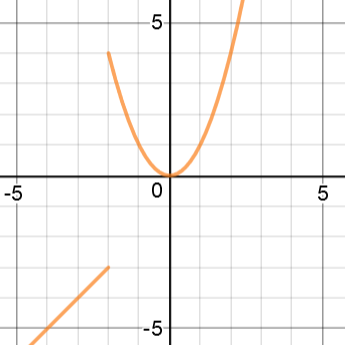
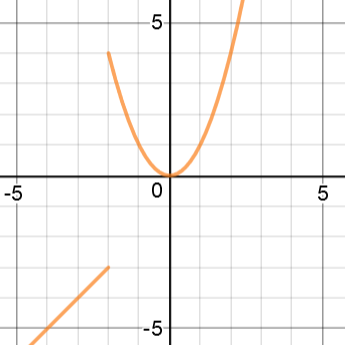


Over an open interval

For f to be continuous over (a, b), f must be continuous at every point in (a,b)

is continuous over (-2,2) is not continuous over (-2,2)

Because is not continuous at x = 0

Over a closed interval

For f to be continuous over [a,b],

* must be continuous on (a,b)

is continuous over [-2,2] is not continuous over [-2,2]

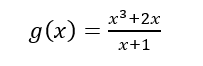
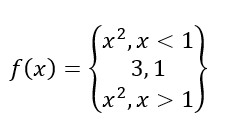
Because

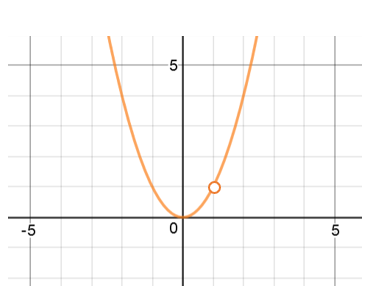
## What is a Discontinuity?

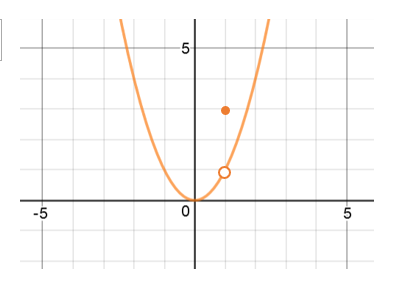
A discontinuity is a point within an interval where is not continuous. There are two types of discontinuities: removable and non-removeable.

Removeable:

A removeable continuity, or a hole, can be fixed by redefining at just one point. This happens when exists but does not exist or is not equal to the limit.

Algebraically, if leads to indeterminate form, a removeable discontinuity should occur at .

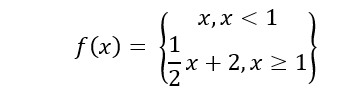




Both and have removeable discontinuity at x = -2, because making makes this function continuous

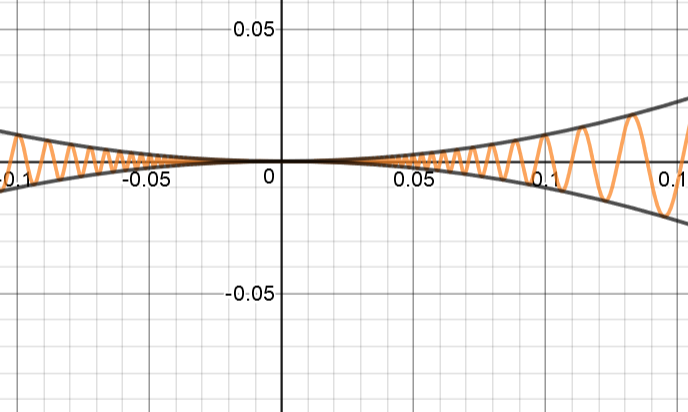
Non-removeable:

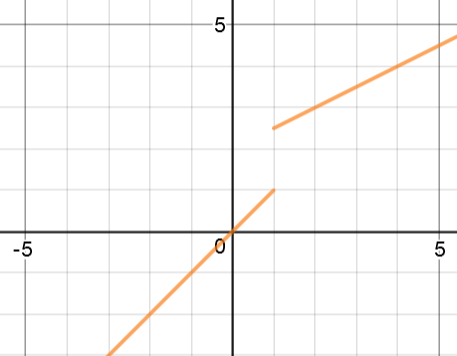
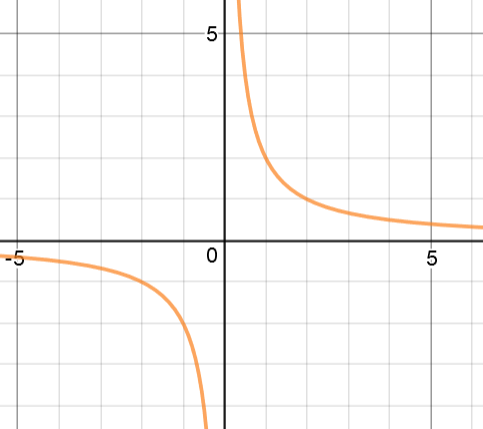
A non-removeable discontinuity cannot be removed by redefining at one point. This happens when does not exist, and either does or does not exist. If there is a non-removeable discontinuity.



## The Squeeze Theorem

If for all x in an open interval containing c, except possibly at c itself, and if then exists and is equal to L.

In general terms: If a function is between 2 other functions that share a limit then the function will share the same limit.

 according to the squeeze theorem

has a non-removable discontinuity at has a non-removable discontinuity at

because because

## Intermediate Value Theorem

*If is continuous on the closed interval and is any number between and then there is at least one number in where*

The IVT can guarantee that a function reaches a certain height over an interval based on its endpoints

Example of how the IVT could be used:

Use the IVT to show that has a zero in [-2,2]

is a polynomial so it is continuous

so there exists a c such that