

Infinite Limits

<http://www.brightstorm.com/math/calculus/limits-and-continuity/infinite-limits-vertical-asymptotes/>

When a **Calculus limit** decreases or increases without bound near certain values for the independent variables, we call these **infinite limits**. In general, a fractional function will have an infinite limit if the limit of the denominator is zero and the limit of the numerator is not zero. The infinite limit can be either positive or negative and is determined by the sign of the quotient of the numerator and the denominator.

Questions:

1. What is a limit of a function?
2. What are independent variables?
3. What is the denominator?
4. What is the quotient?

Listen to the extract and fill in the missing words.

Let's take another look at one sided limits, consider the function g of $x=10x$ over $x-2$. And I want to look 1)..... at the limit as x approaches 2 from the left of g of x . Now you know something is interesting is going to happen because if $x=2$ this thing is undefined. So we're going to kind of 2)..... it from the left.

Let's start with the number the number 1, so we have g of x equals $10x1$ or 10 over $1-2$, -1 that's going to be -10 . Now let's get a little closer to 2, 1.9 $10x1.9$ is 19 . $1.9-2$ is -0.1 this is going to be, it's like $19x-10$ -190 .

And let me just 3)..... this up the rest the values 1.99 , 1.999 I would get -1990 , -19990 . What's happening to the g of x values as x gets closer and closer to 2. They seem to be decreasing more and more rapidly, and we say that they're going to negative infinity. So we would say this limit is negative infinity. Limit as x approaches 2 from the left of g of x is negative infinity. The values decrease 4) 2 words.....

Now let's see what happens when x approaches two from the right. So 4)..... a number to the right of 2 like 3, $10x3$ is 30 over $3-2$ 1 is 30 . Let's try a little closer to 2 2.1 , $10x2.1$ is 21 over $2.1-2$ of a 0.1 that's going to be 210 and then just to fill in the rest of the values is getting closer and closer to 2 we have 2.01 , 2.001 and we get 5)....., 20010 . You can see that as these values get closer and closer to 2 the y values get closer and closer or they increase without bound they get closer to infinity.

So we say that this limit is infinity, now you've seen functions like this before this is g of x equals $10x$ over $x-2$. As x approaches 2 from the left the function is going to negative infinity. And as x approaches 2 from the right it's going to positive infinity. These limits 6)..... the presence of a vertical asymptote.

And that 7) 2 words..... to this definition a line a vertical line $x=a$ is a vertical asymptote of the graph of a function $y=f$ of x if one of these four things is true. Either the limit as x approaches a from the left of f of x is plus infinity or it's minus infinity. Or the limit as x approaches a from the right is plus infinity or minus infinity. 8)..... of those four things is true $x=a$ as a vertical asymptote, in this case we have two of those things true, the limit is x approaches 2 from the left is negative infinity. The limit as x approaches 2 from the right is positive infinity.