Lecture 8

Saturday, September 14, 2024 2:40 PM

Recall: the notation $\lim_{x\to a} f(x) = L$ means that as x goes to a (but not equal to a), $f(x)$ goes to L.

As a consequence:
$\lim_{x\to a} f(x) = L$ if and only if $\lim_{x\to a^+} f(x) = L$ and $\lim_{x\to a^-} f(x) = L$.

We have seen many examples where one-sided limits exists. Consider this example:
$f(x) = \sin\left(\frac{1}{x}\right)$
As $x \to 0$, $f(x)$ keeps oscilating between -1 and 1 rather than "calming down" to any specific value.
In this case, none of $\lim_{x\to 0} f(x)$, $\lim_{x\to 0^+} f(x)$, $\lim_{x\to 0^-} f(x)$ exist.

See some more examples on the worksheet.

Next, we relax the notion of limit to allow the limit to be ∞ or $-\infty$. This is important because it allows us to be more specific than just saying that the limit doesn't exist. Graphically, the limit being either ∞ or $-\infty$ corresponds to a vertical asymptote.

See some more examples on the worksheet.