

Section 2.3: Limit laws

To help us compute limits, we've got a whole bunch of

Basic Limit Laws. Let $f(x)$ and $g(x)$ be functions such that both $\lim_{x \rightarrow c} f(x)$ and $\lim_{x \rightarrow c} g(x)$ are defined.

1. $\lim_{x \rightarrow c} (f(x) + g(x)) = \underline{\hspace{2cm}}$. (That is, "the limit of a sum is the _____ of the limits.")
2. $\lim_{x \rightarrow c} (f(x) - g(x)) = \underline{\hspace{2cm}}$. (That is, "the limit of a difference is the _____ of the limits.")
3. For any constant k , $\lim_{x \rightarrow c} kf(x) = k \lim_{x \rightarrow c} f(x)$. (That is, "the limit of a constant times a function is that constant, times the limit of the function.")
4. $\lim_{x \rightarrow c} (f(x) \cdot g(x)) = \underline{\hspace{2cm}}$. (That is, "the limit of a product is the _____ of the limits.")
5. If $\lim_{x \rightarrow c} g(x) \neq 0$, then $\lim_{x \rightarrow c} \left(\frac{f(x)}{g(x)}\right) = \underline{\hspace{2cm}}$. (That is, "the limit of a quotient is the _____ of the limits.")

Another law that might come in handy is the following law for constant functions: for any constant a ,

$$\lim_{x \rightarrow c} a = a.$$

Let's work on some homework problems together, shall we? The homework for this section (listed below) asks you to use the limit laws to evaluate various limits carefully. Below are a number of the limits contained in the homework; get together with your groupmates and evaluate them!

1. $\lim_{x \rightarrow 9} x$
2. $\lim_{x \rightarrow 9} 14$
3. $\lim_{x \rightarrow -3} 3x + 4$
4. $\lim_{y \rightarrow -3} y + 14$
5. $\lim_{t \rightarrow 4} 3t - 14$
6. $\lim_{x \rightarrow \frac{1}{2}} (4x + 1)(2x - 1)$

7. $\lim_{x \rightarrow 2} x(x+1)(x+2)$
8. $\lim_{t \rightarrow 9} \frac{t}{t+1}$
9. $\lim_{x \rightarrow 3} \frac{1-x}{1+x}$
10. $\lim_{t \rightarrow 2} t^{-1}$
11. $\lim_{x \rightarrow 3} x^2 + 9x^{-3}$
12. Assuming $\lim_{x \rightarrow -4} f(x) = 3$ and $\lim_{x \rightarrow -4} g(x) = 1$, find $\lim_{x \rightarrow -4} f(x)g(x)$.
13. Assuming $\lim_{x \rightarrow -4} f(x) = 3$ and $\lim_{x \rightarrow -4} g(x) = 1$, find $\lim_{x \rightarrow -4} \frac{g(x)}{x^2}$.

Homework from Section 2.3 (pp. 82-83): numbers 1-27, odd numbers only, and 36 and 37.
This homework is due on *Friday, September 11th*.