

Limit Laws

If L , M , and c are real numbers and $\lim_{x \rightarrow \infty} f(x) = L$ and $\lim_{x \rightarrow \infty} g(x) = M$, then

1. constant rule: $\lim_{x \rightarrow \infty} c = c$
2. identity function rule: $\lim_{x \rightarrow \infty} x = \infty$
3. sum rule: $\lim_{x \rightarrow \infty} (f(x) + g(x)) = L + M$
4. difference rule: $\lim_{x \rightarrow \infty} (f(x) - g(x)) = L - M$
5. constant multiple rule $\lim_{x \rightarrow \infty} (c \cdot f(x)) = c \cdot \lim_{x \rightarrow \infty} f(x) = c \cdot L$
6. product rule $\lim_{x \rightarrow \infty} (f(x) \cdot g(x)) = L \cdot M$
7. quotient rule If $M \neq 0$ then $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)} = \frac{L}{M}$
8. power rule $\lim_{x \rightarrow \infty} (f(x))^n = L^n \quad n \in \mathbb{N}$
9. root rule $\lim_{x \rightarrow \infty} \sqrt[n]{f(x)} = \sqrt[n]{L} = L^{1/n} \quad n \in \mathbb{N}$
If n is even, we assume that $\lim_{x \rightarrow \infty} f(x) = L \geq 0$.
10. replacement rule: If the functions t and s have the same values for all but finitely many values of x , then $\lim_{x \rightarrow \infty} t(x) = \lim_{x \rightarrow \infty} s(x)$

Note that all statements are true for limits as $x \rightarrow -\infty$