Basic Limit Laws

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Listed here are a couple of basic limits and the standard limit laws which, when used in conjunction, can find most limits. They are listed for standard, two-sided limits, but they work for all forms of limits. However, note that if a limit is infinite, then the limit does *not* exist.

Basic Limits

If *c* is a constant, then $\lim_{x \to a} c = c$.

$$\lim_{x \to a} x = a.$$

Limit Laws

Addition Law

If the limits $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, then

$$\lim_{x \to a} f(x) + g(x) = \lim_{x \to a} f(x) + \lim_{x \to a} g(x).$$

Subtraction Law

If the limits $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, then

$$\lim_{x \to a} f(x) - g(x) = \lim_{x \to a} f(x) - \lim_{x \to a} g(x).$$

Constant Law

If *c* is a constant, and the limit $\lim_{x \to a} f(x)$ exists, then

$$\lim_{x \to a} c \cdot f(x) = c \cdot \lim_{x \to a} f(x).$$

Multiplication Law

If the limits

$$\lim_{x \to a} f(x)$$

and

$$\lim_{x \to a} g(x)$$

both exist, then

$$\lim_{x \to a} f(x) \cdot g(x) = \lim_{x \to a} f(x) \cdot \lim_{x \to a} g(x)$$

.

Division Law

If the limits $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, and $\lim_{x \to a} g(x) \neq 0$, then

$$\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}.$$

Power Law

If *n* is an integer, and the limit $\lim_{x \to a} f(x)$ exists, then

$$\lim_{x \to a} (f(x))^n = \left(\lim_{x \to a} f(x)\right)^n.$$

Root Law

If *n* is an integer, the limit $\lim_{x \to a} f(x)$ exists, and that limit is positive if *n* is even, then

$$\lim_{x \to a} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x \to a} f(x)}.$$

Squeeze Law

If $f(x) \leq g(x) \leq h(x)$ for all *x* in an open interval that contains *a*, except possibly at *a* itself, and $\lim_{x \to a} f(x) = \lim_{x \to a} h(x) = L$, then

$$\lim_{x \to a} g(x) = L.$$

Composition Law

If f is continuous at b and $\lim_{x \to a} g(x) = b$, then

$$\lim_{x \to a} f(g(x)) = f(b) = f\left(\lim_{x \to a} g(x)\right).$$

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