

## Properties of Limits & Limit Laws

Suppose that  $k$  is a constant,  $n$  is a positive integer, and the limits  $\lim_{x \rightarrow c} f(x)$  and  $\lim_{x \rightarrow c} g(x)$  exist.

1.  $\lim_{x \rightarrow c} [f(x) + g(x)] = \lim_{x \rightarrow c} f(x) + \lim_{x \rightarrow c} g(x)$
2.  $\lim_{x \rightarrow c} [f(x) - g(x)] = \lim_{x \rightarrow c} f(x) - \lim_{x \rightarrow c} g(x)$
3.  $\lim_{x \rightarrow c} k \cdot f(x) = k \left( \lim_{x \rightarrow c} f(x) \right)$
4.  $\lim_{x \rightarrow c} [f(x) \cdot g(x)] = \left( \lim_{x \rightarrow c} f(x) \right) \cdot \left( \lim_{x \rightarrow c} g(x) \right)$
5.  $\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \frac{\lim_{x \rightarrow c} f(x)}{\lim_{x \rightarrow c} g(x)}$  if  $g(x) \neq 0$
6.  $\lim_{x \rightarrow c} [f(x)]^n = \left( \lim_{x \rightarrow c} f(x) \right)^n$
7.  $\lim_{x \rightarrow c} k = k$
8.  $\lim_{x \rightarrow c} x = c$
9.  $\lim_{x \rightarrow c} x^n = c^n$
10.  $\lim_{x \rightarrow c} \sqrt[n]{x} = \sqrt[n]{c}$
11.  $\lim_{x \rightarrow c} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x \rightarrow c} f(x)}$  [If  $n$  is even, then we also need that  $\lim_{x \rightarrow c} f(x) > 0$ .]

## Limits Toolbox

- Definition of a limit ( $\epsilon$ ,  $\delta$  definition)
- Limit Laws
- Known continuous functions
- Squeeze Theorem
- L'Hôpital's Rule