2.3: Calculating Limits Using the Limit Laws

Friday, April 19, 2024 11:08 PM

Limit Laws:

· Limit laws:
c is constant &

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

exist

① $\lim_{x \to a} [f(x) + g(x)] = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$

② $\lim_{x \to a} [f(x) - g(x)] = \lim_{x \to a} f(x) - \lim_{x \to a} g(x)$

③ $\lim_{x \to a} [c f(x)] = c \lim_{x \to a} f(x)$

④ $\lim_{x \to a} [f(x) g(x)] = \lim_{x \to a} f(x) \cdot \lim_{x \to a} g(x)$

⑤ $\lim_{x \to a} \frac{f(x)}{g(x)} = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$ if $\lim_{x \to a} g(x) \neq 0$

⑥ $\lim_{x \to a} [f(x)]^n = [\lim_{x \to a} f(x)]^n$ (think ⑪)

⑦ $\lim_{x \to a} c = c$

⑧ $\lim_{x \to a} x = a$

⑨ $\lim_{x \to a} x^n = a^n$ where n is pos. $\mathbb{Z}$

⑩ $\lim_{x \to a} \sqrt[n]{x} = \sqrt[n]{a}$ where n is $\mathbb{Z}^+$ (if n is even, presume $a > 0$)

⑪ $\lim_{x \to a} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x \to a} f(x)}$ where n is $\mathbb{Z}^+$ (if n is even, presume $\lim_{x \to a} f(x) > 0$)

· Direct substitution property:
f is rational or polynomial &
"a" is in the domain of "f"

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

↳ if $f(x) = g(x)$ when $x \neq a$, then
$\lim_{x \to a} f(x) = \lim_{x \to a} g(x)$, provided the limits exist

· when doing the proofs for limits, you are going to have to use the limit laws & doing the left & right hand limits

· Squeeze theorem:

$f(x) \le g(x) \le h(x)$

when "x" is near "a" ($x \neq a$)

&

$\lim_{x \to a} f(x) = \lim_{x \to a} h(x) = L$

then

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