2.2: The Limit of a Function

Friday, April 19, 2024 11:07 PM

The Limit of a Function:

- The intuitive definition of a Limit:

f(x) is defined when x is close to # a (but not # a)

$\therefore$

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

- as of right-now, the textbook is using numerical approx. to get the value of the limit

→ ex: $\lim_{x \to a} f(x) = L$

$x > a$	$x < a$
value 1	value 1
⋮	⋮
n value$_a$	n value$_b$

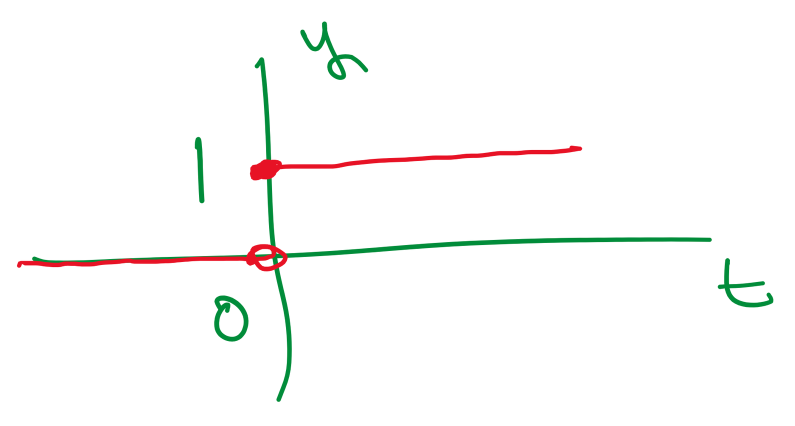
→ these two should be close

- Section talks about CAS
- guessing values is not always the best method as the "correctness" of your answer depends on your stop-point

One-Sided Limits:

- The Heaviside function H:

$$H(t) = \begin{cases} 0 & \text{if } t < 0 \\ 1 & \text{if } t \geq 0 \end{cases}$$



The $\lim_{t \to 0} H(t) = DNE$ however it approaches 1 from the right & 0 from the left

$\therefore$

$$\lim_{t \to 0^-} H(t) = 0 \quad \& \quad \lim_{t \to 0^+} H(t) = 1$$

- Definition of a one sided limit:

$\lim_{x \to a^-} f(x) = L_1$ or

$\lim_{x \to a^+} f(x) = L_2$

→ $\therefore$ $\lim_{x \to a} f(x) = L$ iff

$$\underbrace{\lim_{x \to a^-} f(x) = L \quad \& \quad \lim_{x \to a^+} f(x) = L}_{\text{same limit}}$$

- intuitive definition of an infinite Limit:

$x > a$ & or $x < a$ but $x \neq a$

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

→ not a #, just a concept

→ another variant

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

→ can be extended to one sided limits ⊖ & ⊕

→ the vertical asymptote can be applied to this

ex: $\lim_{x \to 0^+} \ln x = -\infty$