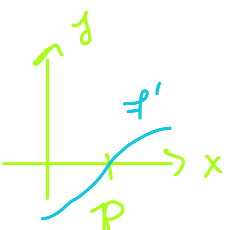
Let $f(x)$ be a function.

- A "critical pt." of $f(x)$ is a pt. $p$ such that $f'(p)=0$ or $f'(p)$ is undefined.

- <u>$2^{nd}$ der. test</u>: $p$ critical pt of $f$, $f'(p)=0$
    - $f''(p)>0 \Longrightarrow p$ loc. min. of $f$
    - $f''(p)<0 \Longrightarrow p$ loc. max. of $f$
    - $f''(p)=0$ tells us nothing

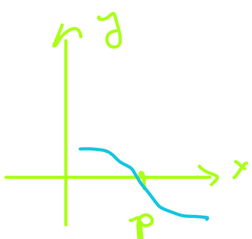
- <u>$1^{st}$ der. test</u>: $p$ critical pt of $f$, $f'(p)=0$
    - $f'$ changes from neg. to pos. at $p$

      $\Longrightarrow p$ local min. at $p$




    - $f'$ changes from pos. to neg. at $p$

      $\Longrightarrow p$ local max. at $p$




- <u>Inflection pts</u>: $f''(p)=0$ or undefined at $p$
    - Choose $x_1 < p < x_2$. If the following

hold, then $p$ is an inflection pt.

- $f(x_1) > 0$ and $f(x_2) < 0$

- $f(x_1) < 0$ and $f(x_2) > 0$

- <u>Global min/max</u>:
  - $f$ on $[a,b]$
    - Find all critical pts of $f$, say $p_1, \dots, p_n$
    - Compare values:

      $f(a), f(b), f(p_1), \dots, f(p_n)$
  - $f$ on $(a,b)$
    - Find all critical pts of $f$, say $p_1, \dots, p_n$
    - Compare values:

      $f(p_1), \dots, f(p_n)$

    - Sketch a graph if needed