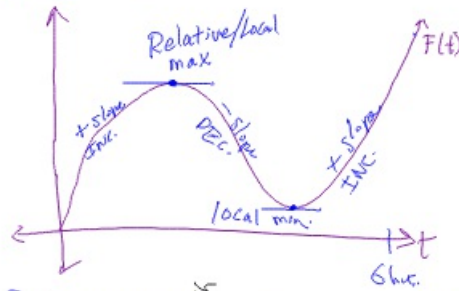


Function Behavior



- Relative max:
 Both $\left\{ \begin{array}{l} \text{Increasing to} \\ \text{Decreasing} \end{array} \right.$
 - slope of zero/horizontal tangent

- Relative min: $\left\{ \begin{array}{l} \text{Decreasing to} \\ \text{Increasing} \end{array} \right.$
 slope of zero/horiz. tangent

ex/ Find Rel. Max/Min:

$$f(x) = 3x^5 - 4x^3 + 2x^2 + 15$$

value function

Plan: Find $f'(x)$. Set equal to zero. Then solve for x . Then, find values of $f'(x)$ "around" the solutions.

ex/ Find all local maxes/mins.

$$f(x) = x^3 - 3x^2 - 9x - 10$$

$$f'(x) = 3x^2 - 6x - 9 = 0$$

$$3(x^2 - 2x - 3) = 0$$

$$3(x-3)(x+1) = 0$$

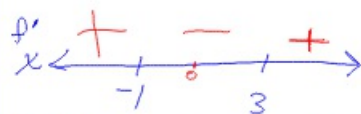
$$x-3=0$$

$$x+1=0$$

$$x=3$$

$$x=-1$$

factoring quadratics
 what multiplier to give -3
 and add to give -2?

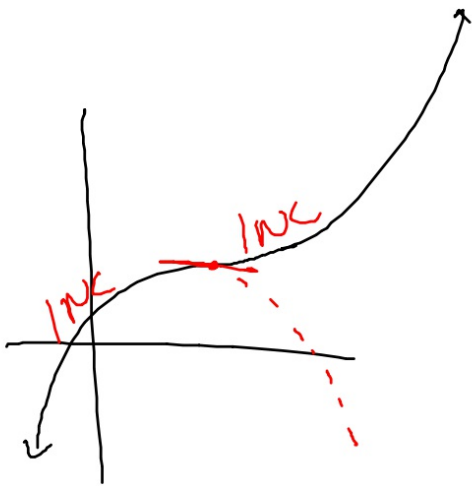


Critical values/numbers
 occur when $f'(x) = 0$
 or $f'(x)$ is undefined (dividing by zero)

- ① find a number in each interval.
- ② plug into f' .
- ③ find positivity/negativity of each test value.

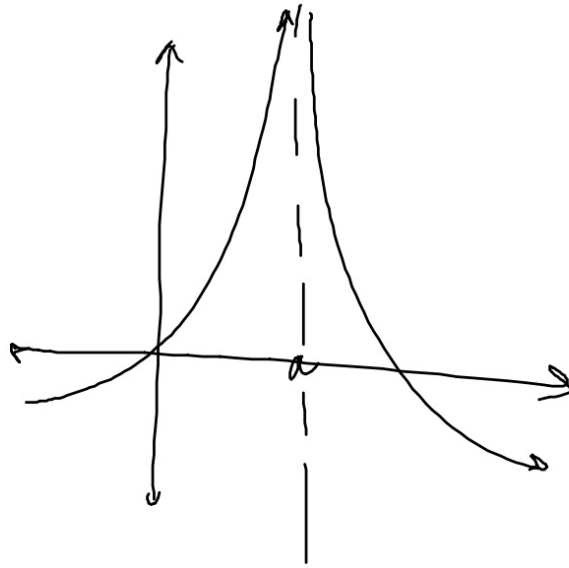
At $x=1$, f' has a rel. max. b/c f goes from inc to dec, and $f'(1) = 0$.

At $x=3$, f' has a rel. min, b/c f goes from dec. to inc, and $f'(3) = 0$.



Slope is zero/Horiz.
tangent,
but, not going from
inc \rightarrow dec.

Therefore, not a rel
max.



Slope goes from inc to
dec.

but, no slope of zero,

(no slope at all, actually.)

Therefore, not a rel.
max.