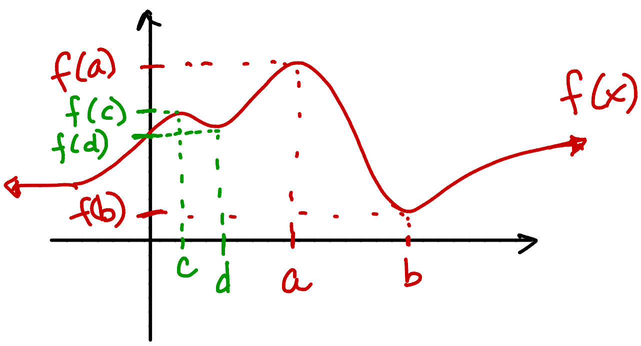
- local and absolute maximums and minimums: what they are and how to find them
- critical points
- closed-interval method

1. local and absolute maximums and minimums: what they are



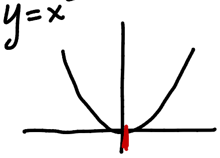
- $f(a)$ is an absolute maximum because $f(a) \geq f(x)$ for all x in domain
- $f(b)$ is an absolute minimum because $f(b) \leq f(x)$ for all x in domain.
- $f(c)$ is a local maximum because $f(c) \geq f(x)$ for all x in an open interval around c.
- $f(d)$ is a local minimum because $f(d) \leq f(x)$ for all x in an open interval around d.

Note: maximums + minimums are y-values.

- critical pts

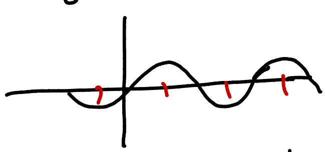
2. A variety of examples

$y=x^2$



- one absolute min. ($y=0$)
- no abs/loc max

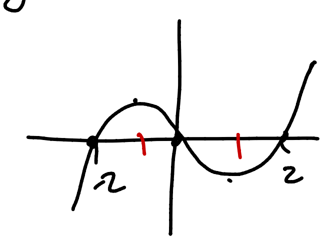
$y=\sin(x)$



- one abs max: $y=1$
- one abs min: $y=-1$

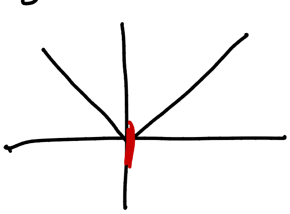
They occur at an infinite # of places

$y=(x+2)(x)(x-2)$



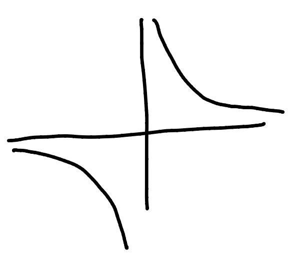
one local max, one local min

$y=|x|$



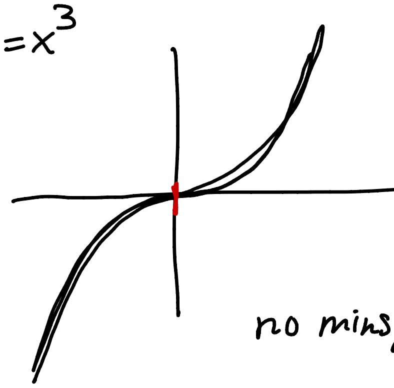
- one abs min
- no max.

$y=\frac{1}{x}$



no mins/max at all

$y=x^3$



no mins/no maxs

3. For each function below find (a) its domain, (b) any critical points, (c) use technology and the information from (b) to identify the local and/or absolute maxima and minima.

(a) $f(x) = (x-2)^{2/3} + 1$

a. D: $(-\infty, \infty)$

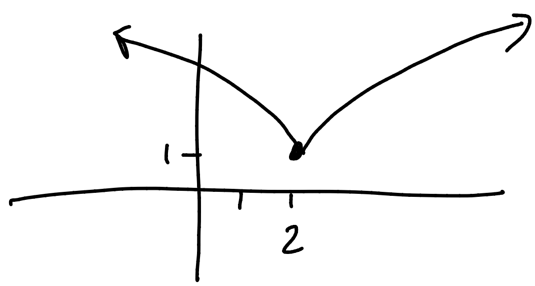
b. $f'(x) = \frac{2}{3}(x-2)^{-1/3} = \frac{2}{3\sqrt[3]{x-2}}$

$\boxed{\text{critical number: } x=2}$

f' undefined at $x=2$

$f(2) = 1$

c.



• $f(x)$ has an absolute min of 1 at $x=2$

(b) $f(x) = x^2(x-2)^3$

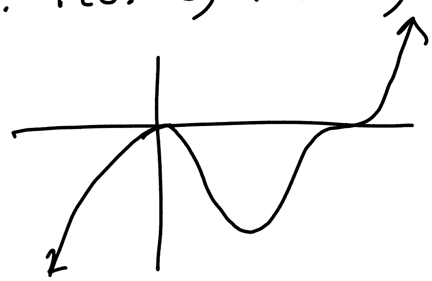
a. D: $(-\infty, \infty)$

b. $f'(x) = 2x(x-2)^3 + x^2 \cdot 3(x-2)^2$
$= x(x-2)^2[2(x-2) + 3x]$
$= x(x-2)(5x-4) = 0$

when $x = 0, 2, 4/5$

$\boxed{\text{critical numbers: } x = 0, 2, 4/5}$

c. $f(0)=0$, $f(2)=0$, $f(\frac{4}{5}) = -1.106$



• local max of 0 at $x=0$
• local min of -1.106 at $x=\frac{4}{5}$