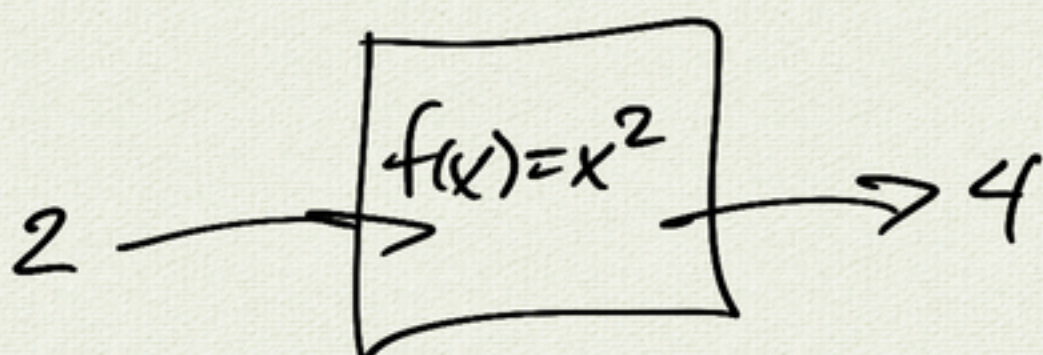
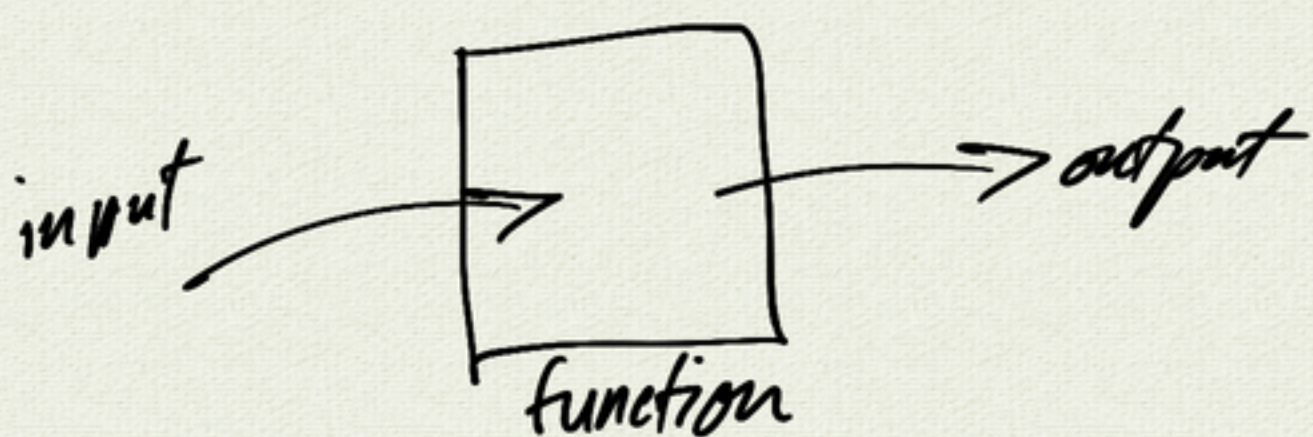


Unit 3

- ① vectors
 - operations: addition, scalar mult.
 - dot product
 - $\vec{u} \cdot \vec{v} = |\vec{u}| |\vec{v}| \cos \theta$
 - find angle between 2 vectors
- ② parametric equations
 - parametrized a line (segment)
 - parametrized a circle (projectiles: don't worry about these)
- ③ polar coordinates
 - convert: rectangular \leftrightarrow polar
 - individual points
 - equations
- ④ analyze polar graph
 - max $|r|$, which θ
 - symmetry
- ⑤ matrices + linear systems
 - matrix equation for linear system
 - find A^{-1} for A 2×2 matrix
 - use to solve system

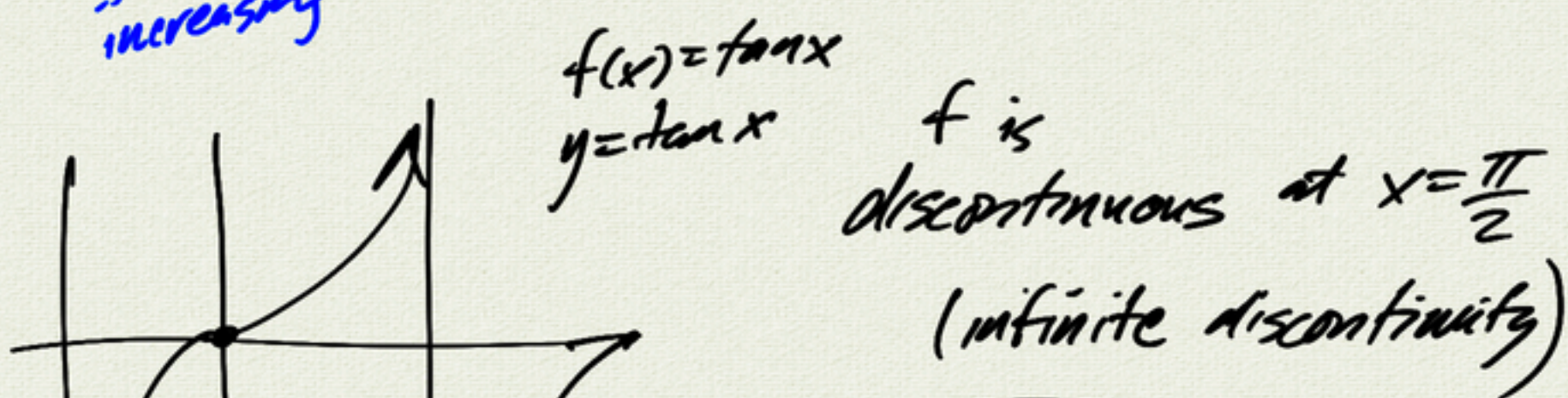
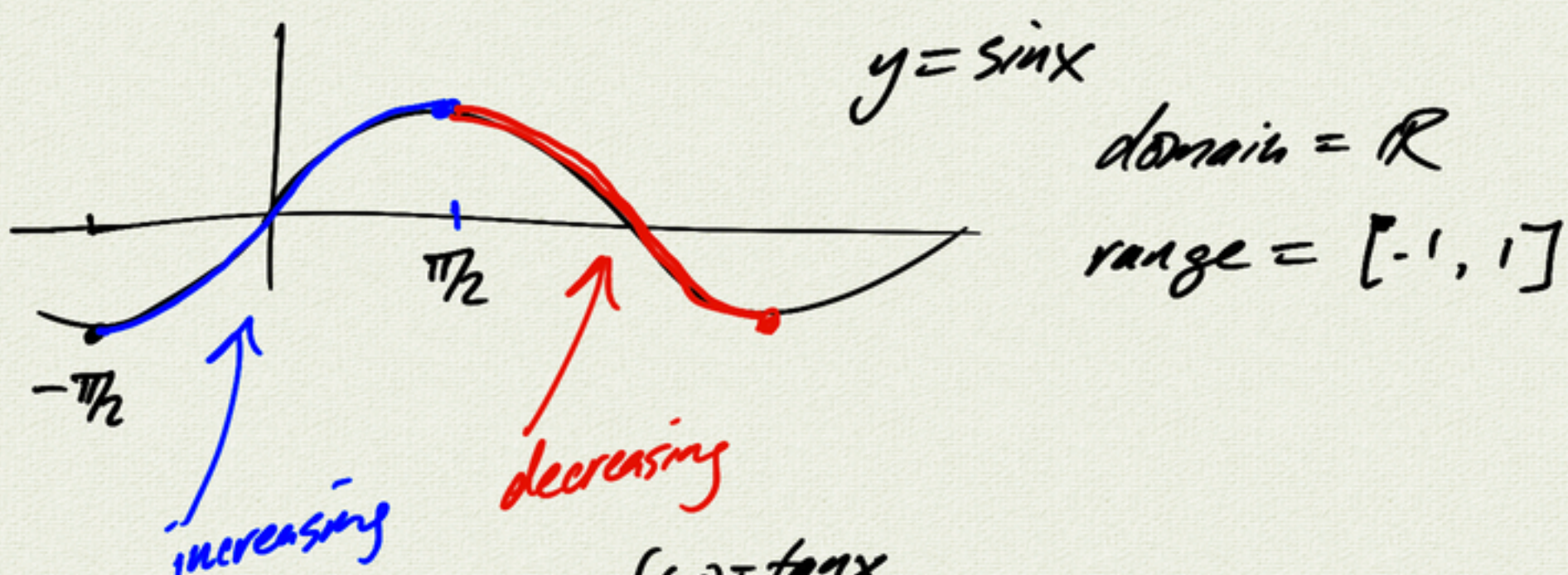
3x3: at-home quiz

4.1 Function properties



domain: where the function is defined

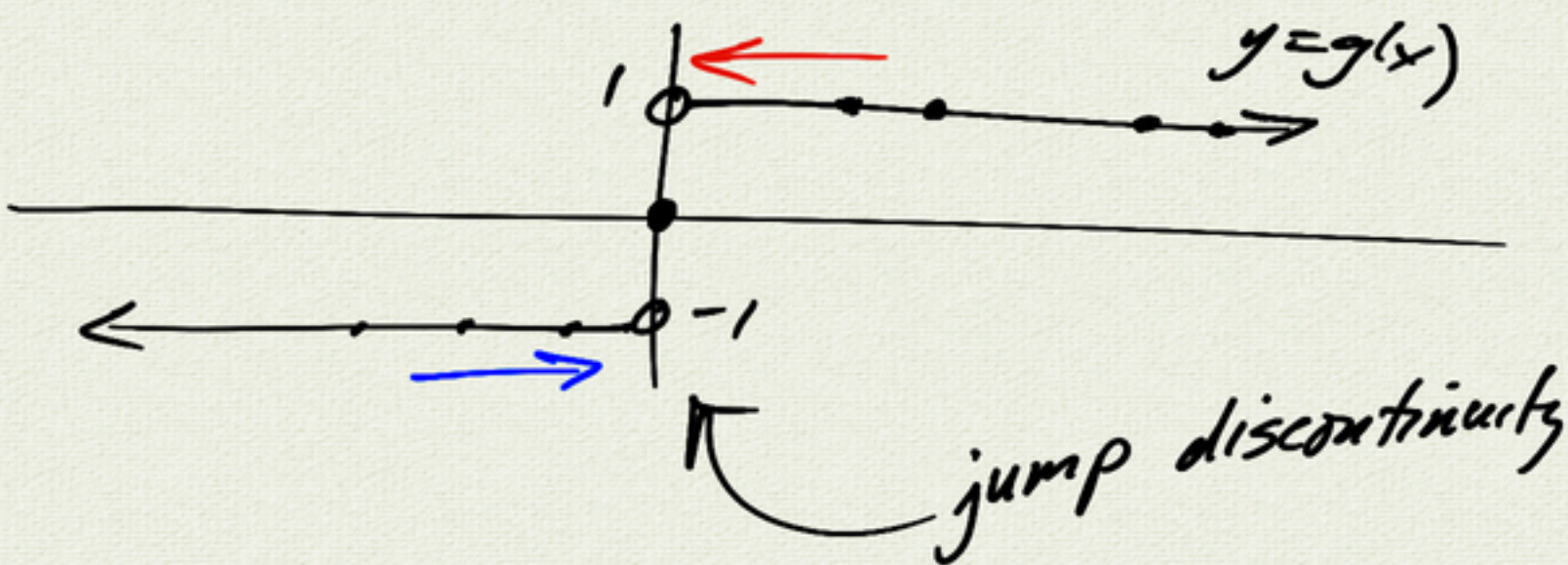
range: set of output values



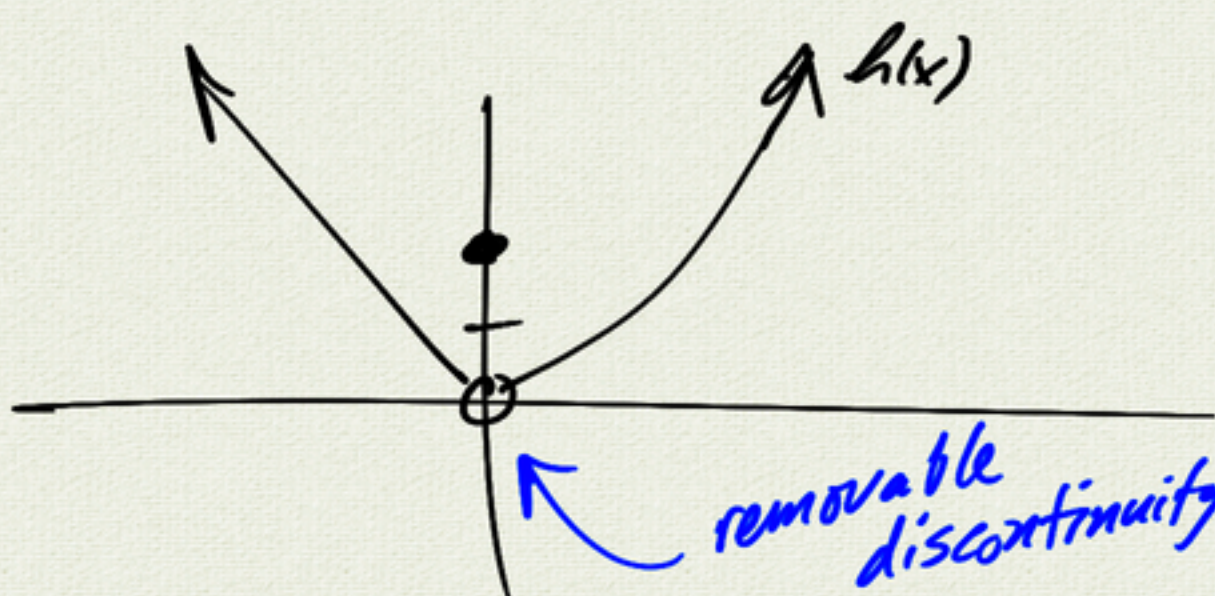
$$g(x) = \begin{cases} \frac{x}{|x|} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

$$g(2) = \frac{2}{|2|} = 1$$

$$g(-2) = \frac{-2}{|-2|} = -1$$

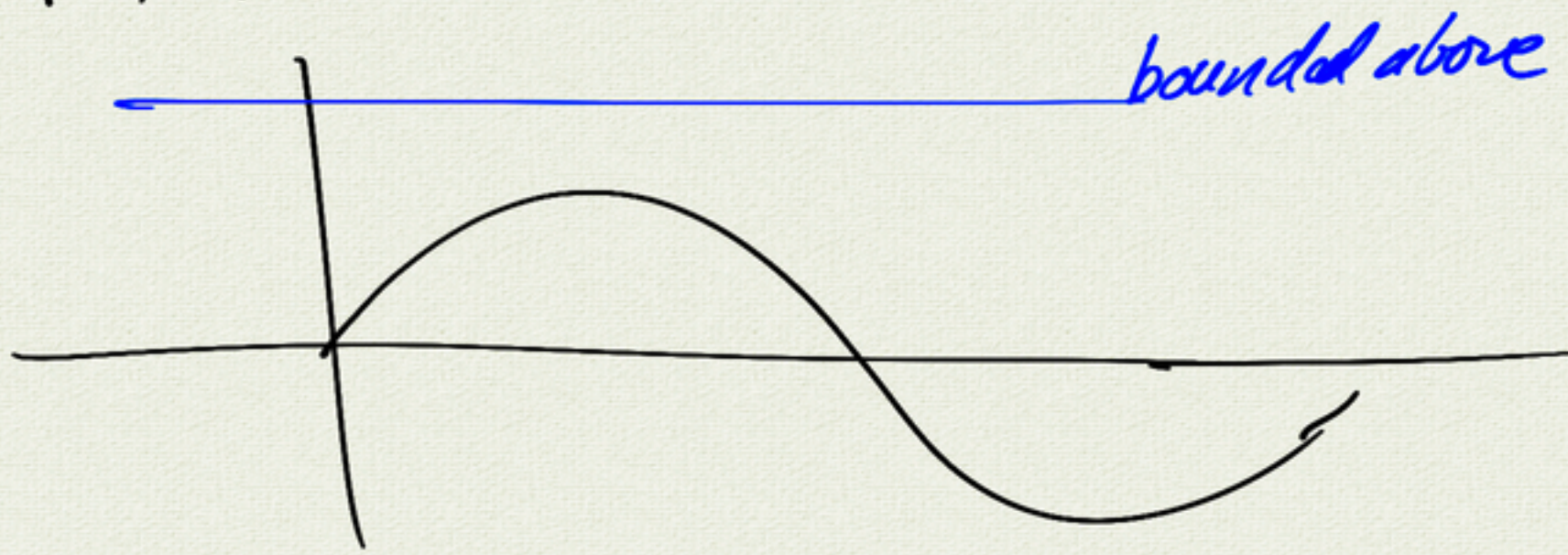


$$h(x) = \begin{cases} -x & \text{if } x < 0 \\ 2 & \text{if } x = 0 \\ x^2 & \text{if } x > 0 \end{cases}$$



(we could remove the discontinuity by setting $h(0) = 0$)

$$f(x) = \sin x$$

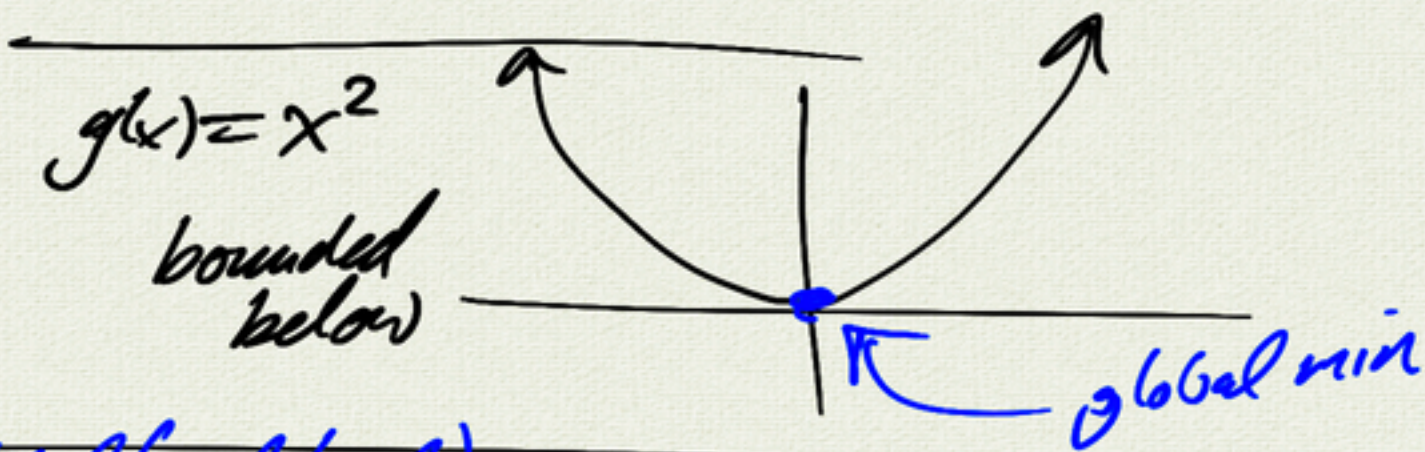


both: bounded

bounded below

e.g. \sin is bounded
 \cos is bounded

tangent is not bounded



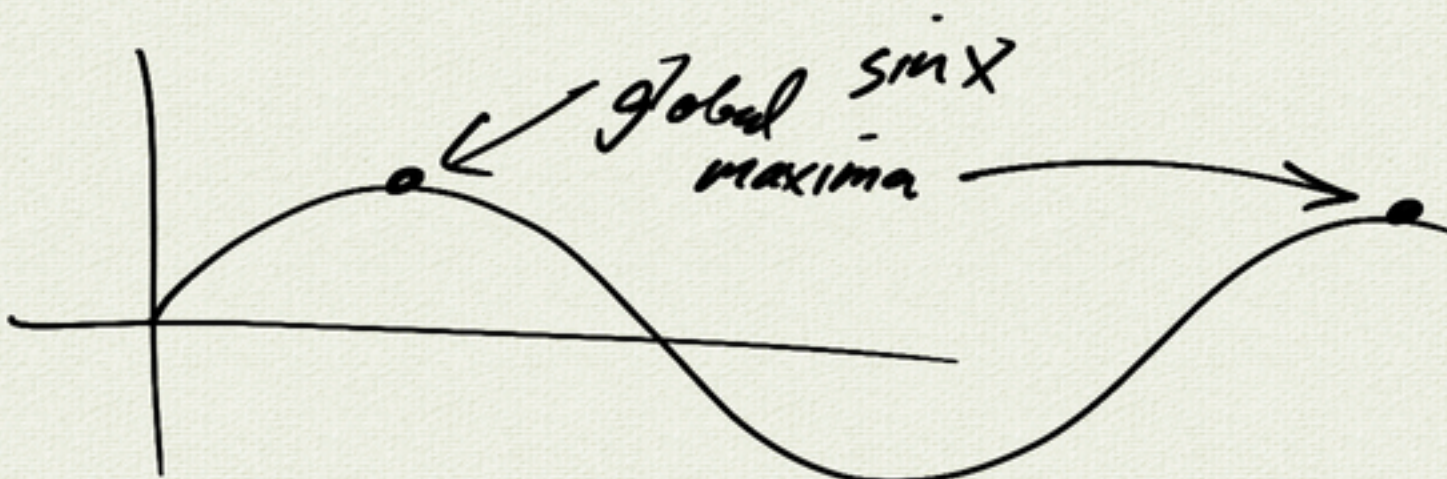
global (and local) maximum

local maximum

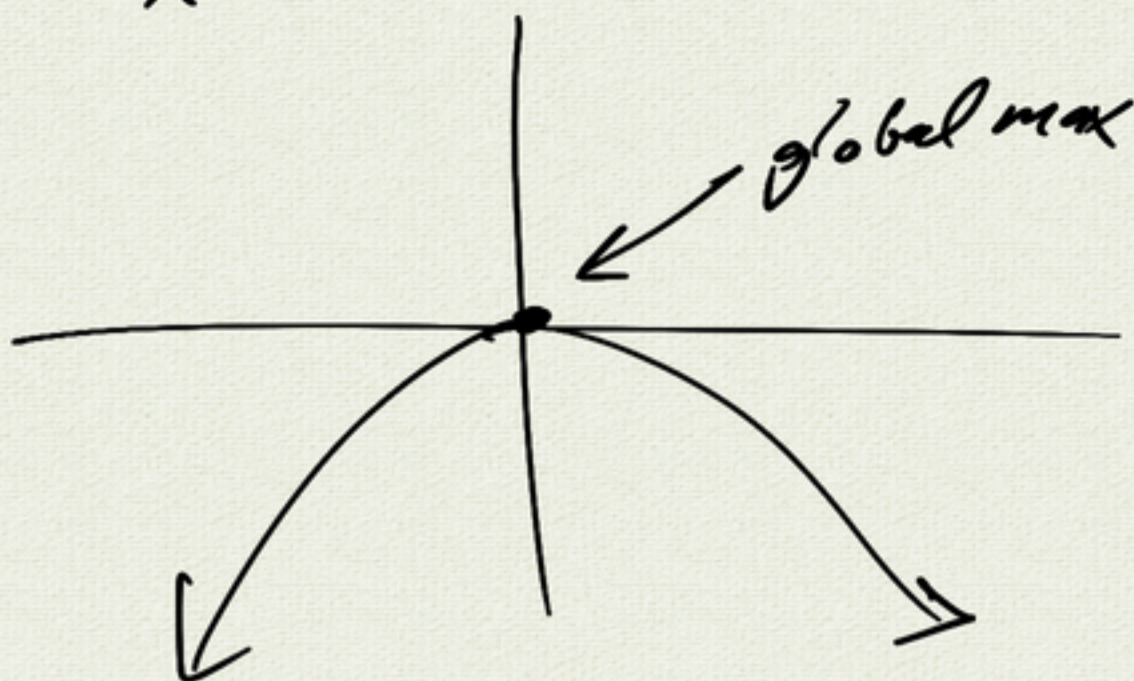
(local = nearby)

local minimum

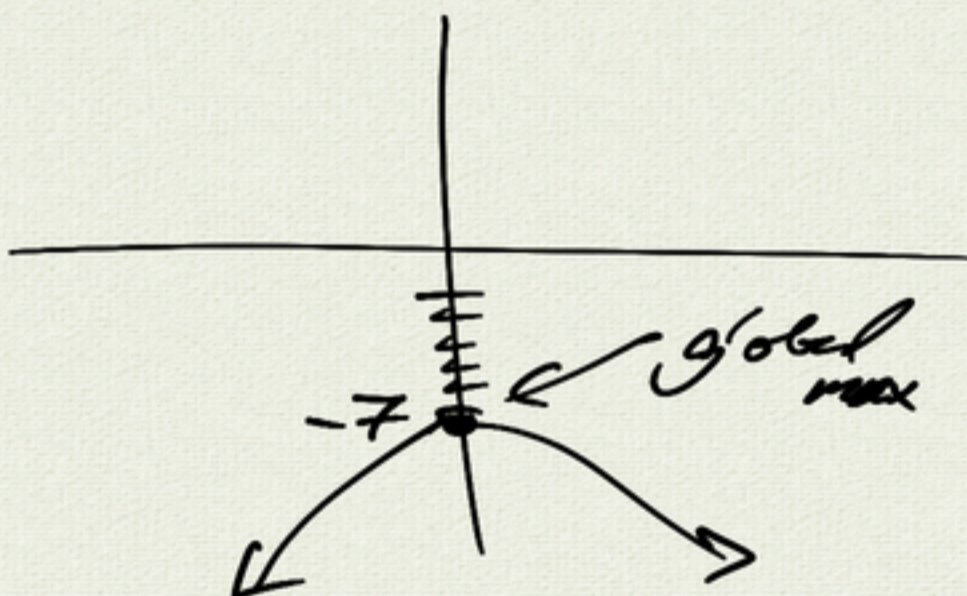
relative min/max = local
 absolute min/max = global



$$h(x) = -x^2$$



$$f(x) = -x^2 - 7$$



$$f(x) = \frac{1}{x}$$

$$\lim_{x \rightarrow -\infty} \frac{1}{x} = 0$$

$$\lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$$

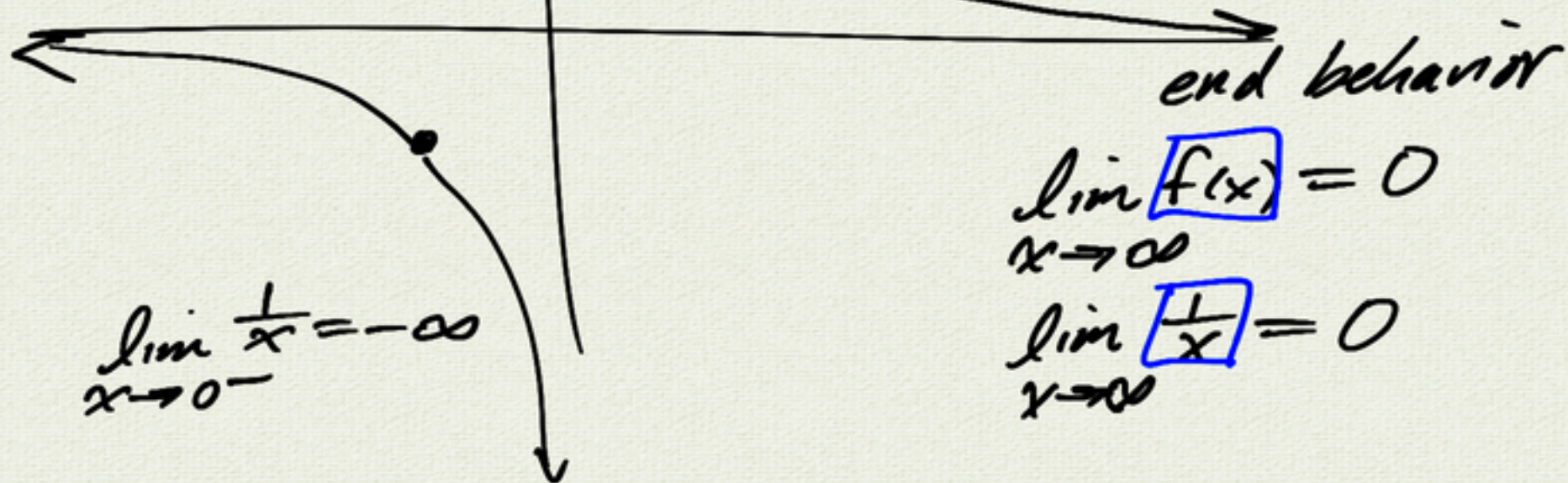
$$\lim_{x \rightarrow 0^+} f(x) = \infty$$

x	$\frac{1}{x}$
1	1
2	$\frac{1}{2}$
10	$\frac{1}{10}$
100	$\frac{1}{100}$
<hr/>	
.1	10
.01	100
.001	1000

end behavior

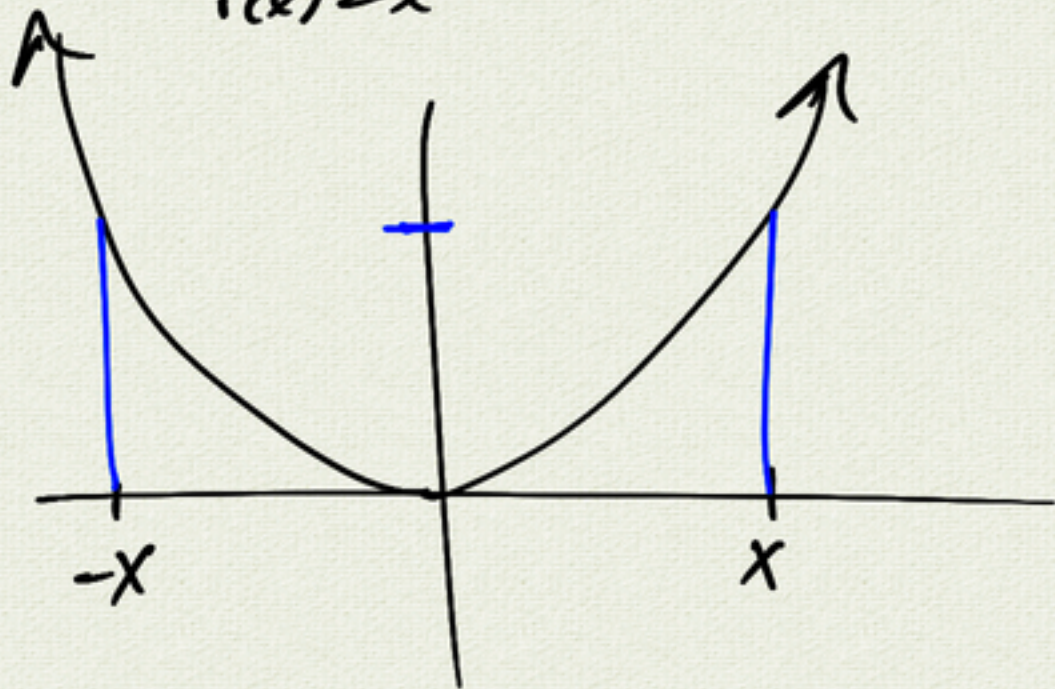
$$\lim_{x \rightarrow \infty} f(x) = 0$$

$$\lim_{x \rightarrow \infty} \frac{1}{x} = 0$$



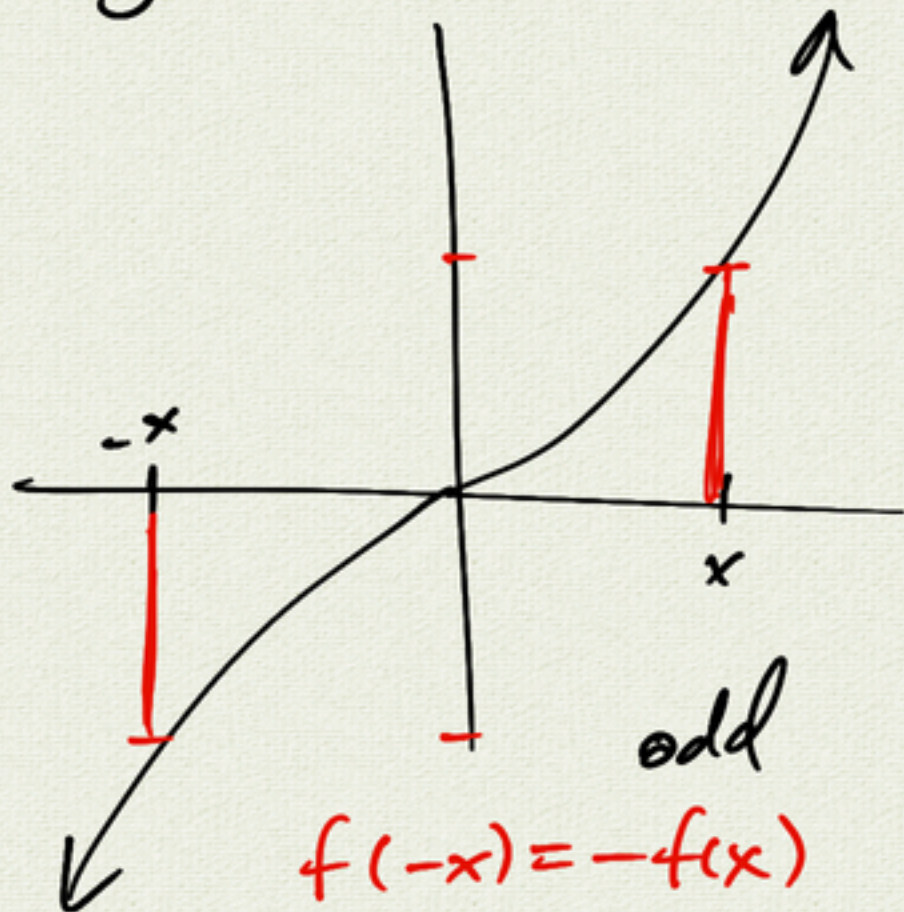
odd/even symmetry

$$f(x) = x^2$$



even
 $f(-x) = f(x)$

$$g(x) = x^3$$



odd
 $f(-x) = -f(x)$