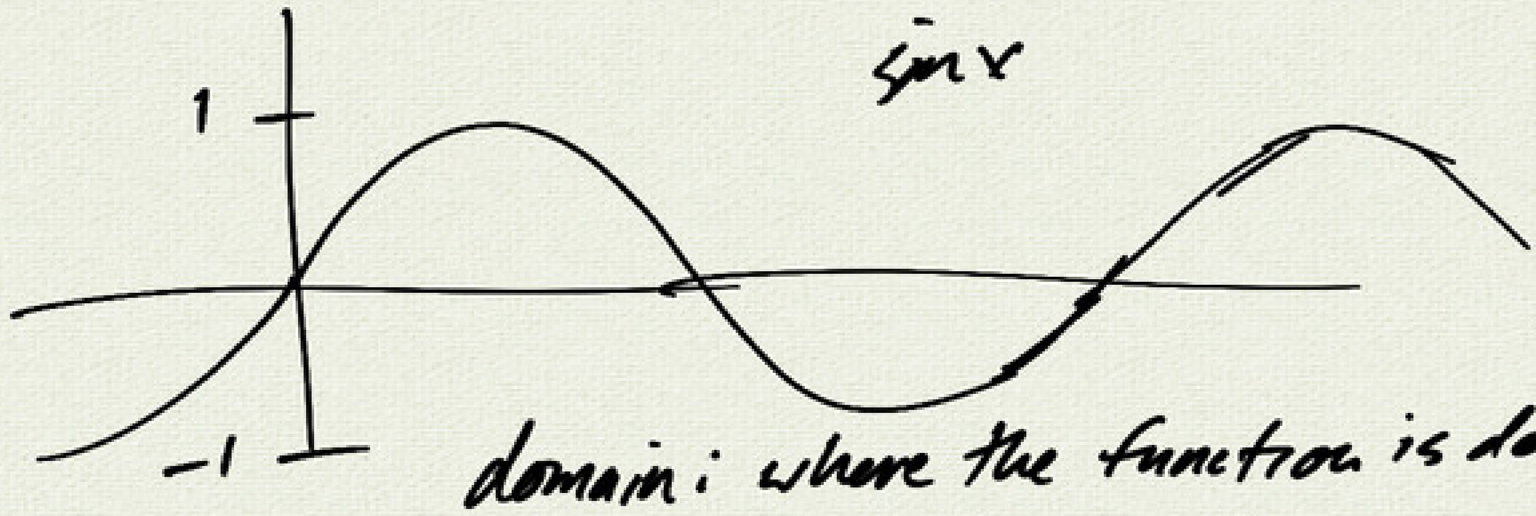
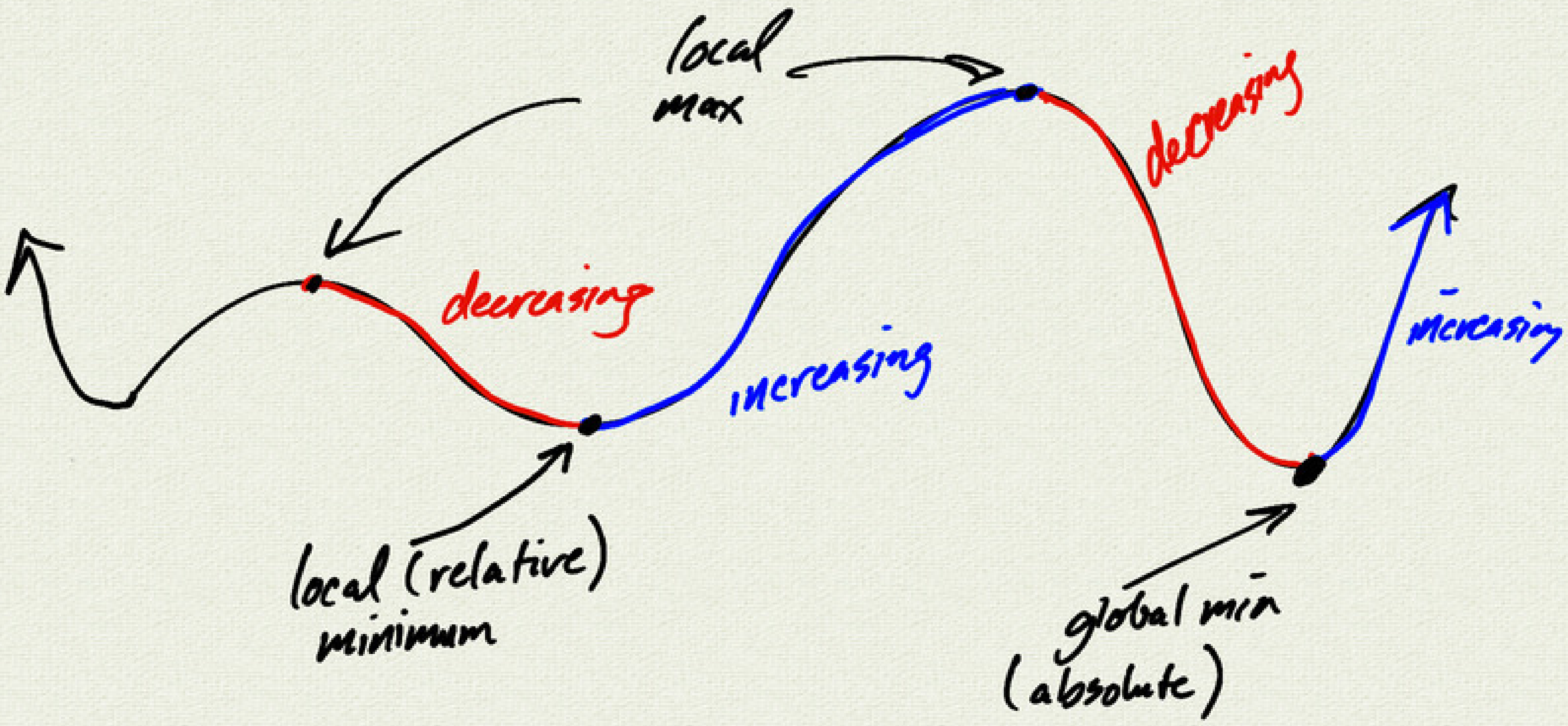
4.1 Function Properties

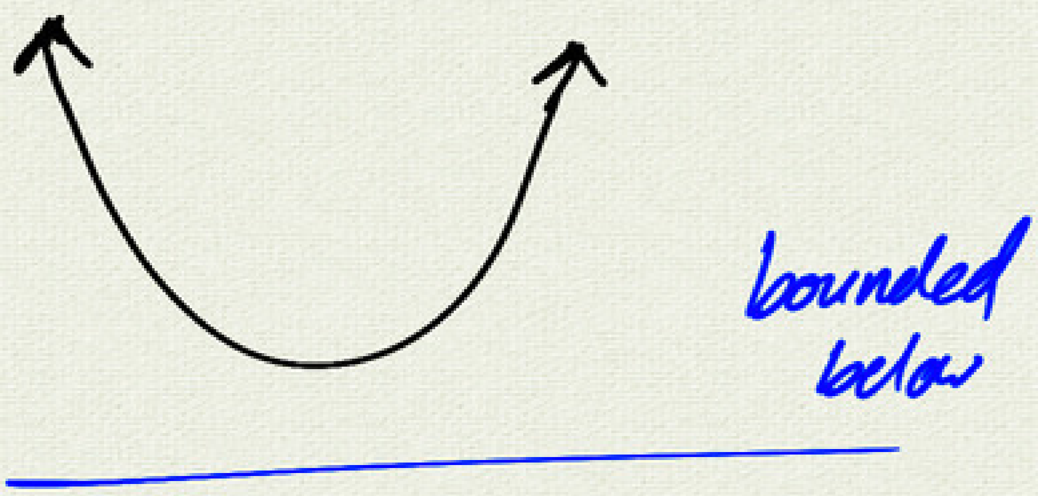
domain/range

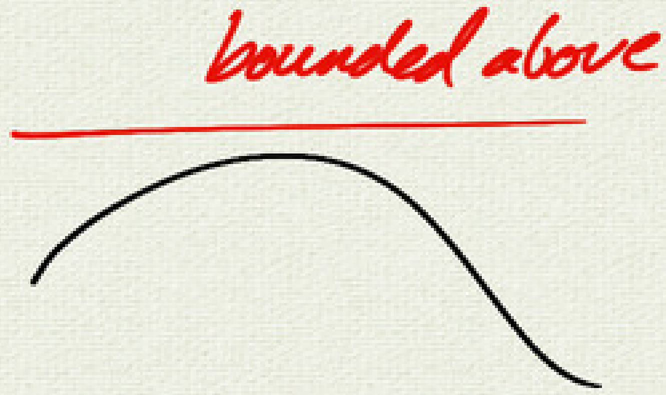


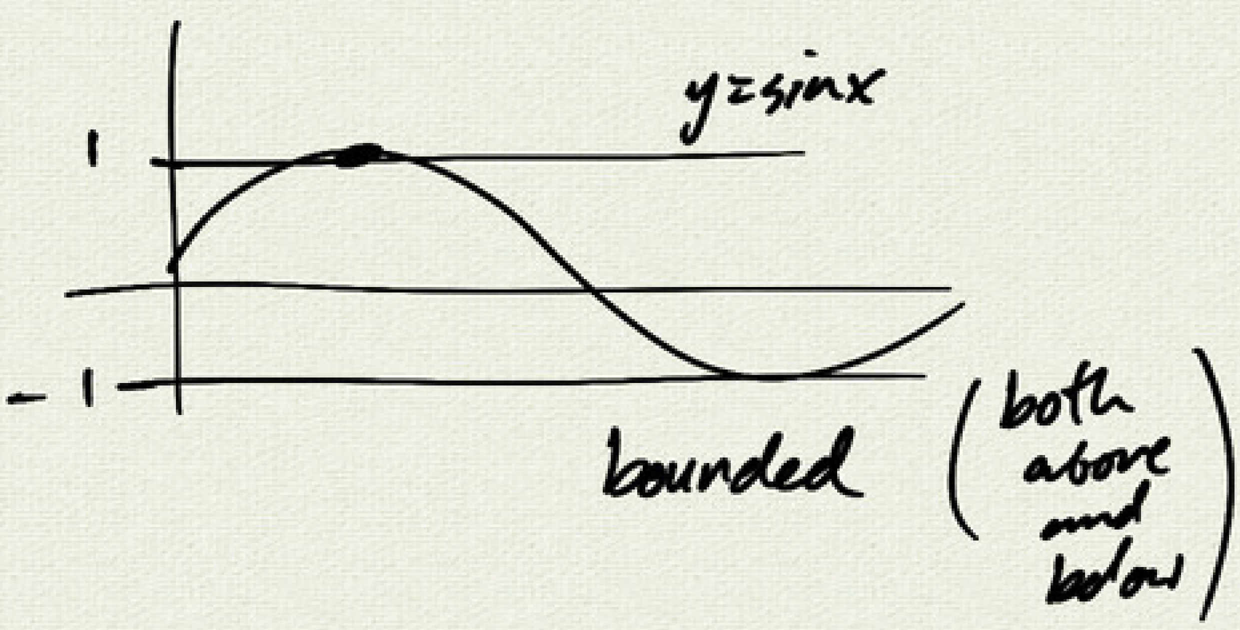
domain: where the function is defined

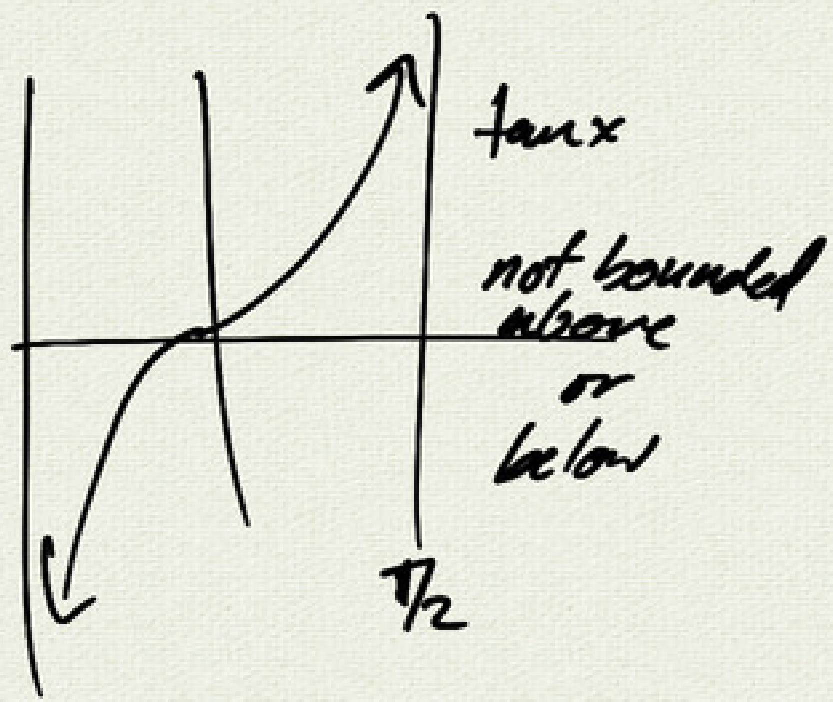
range: the set of all possible function values



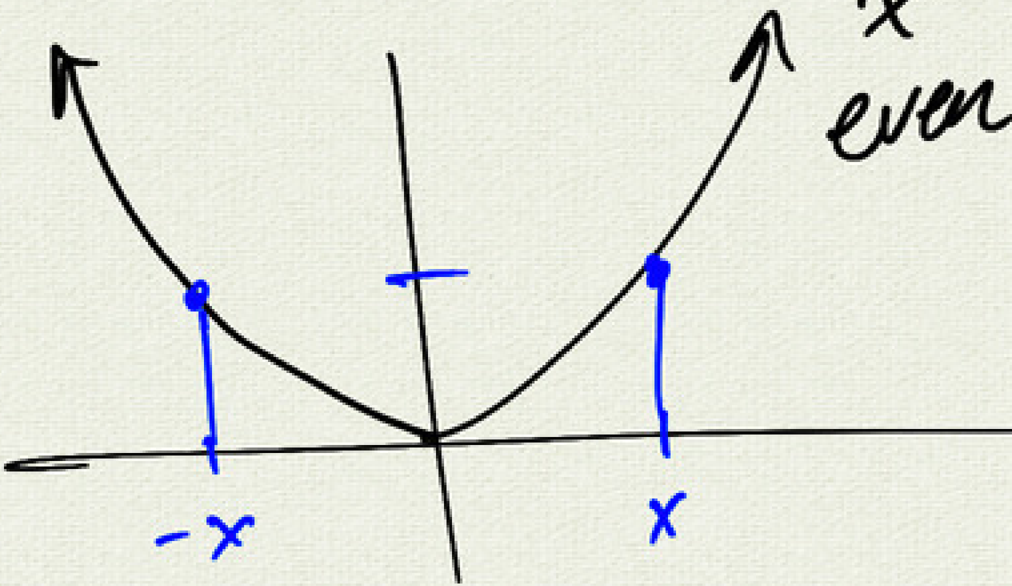




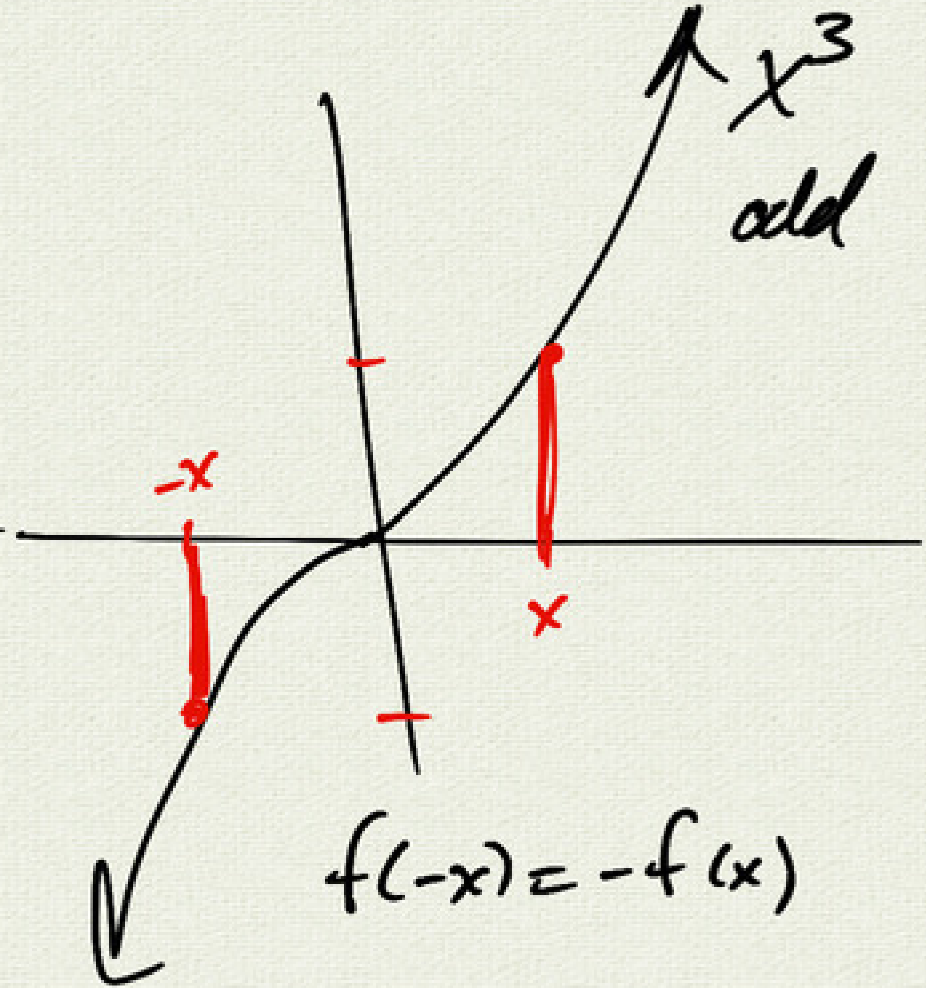




odd/even symmetry



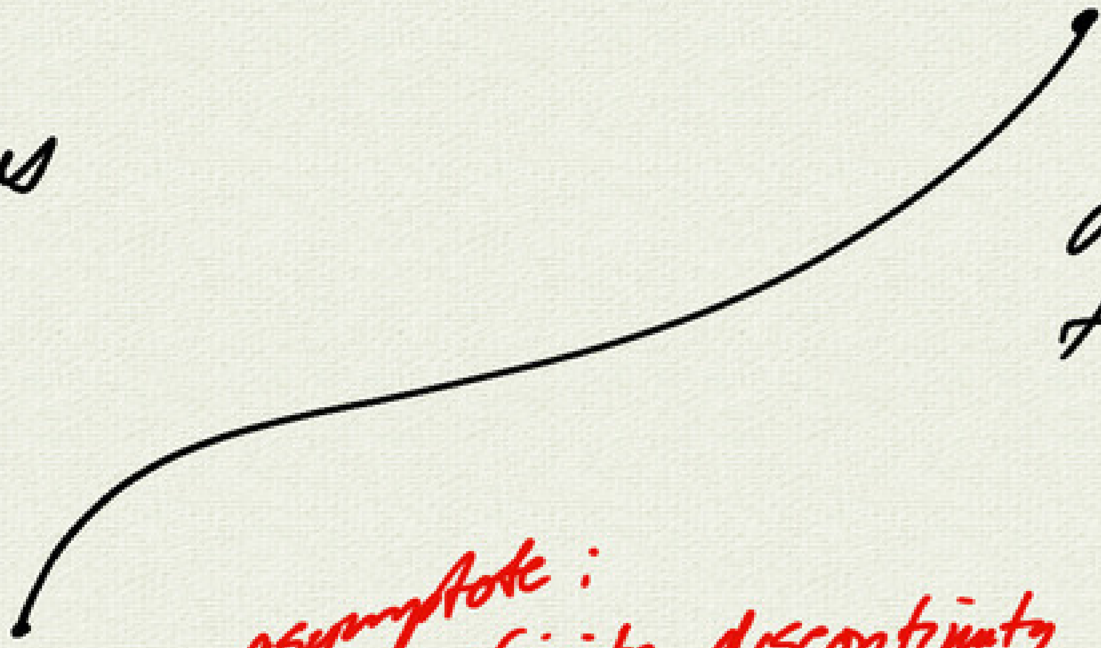
$f(-x) = f(x)$



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

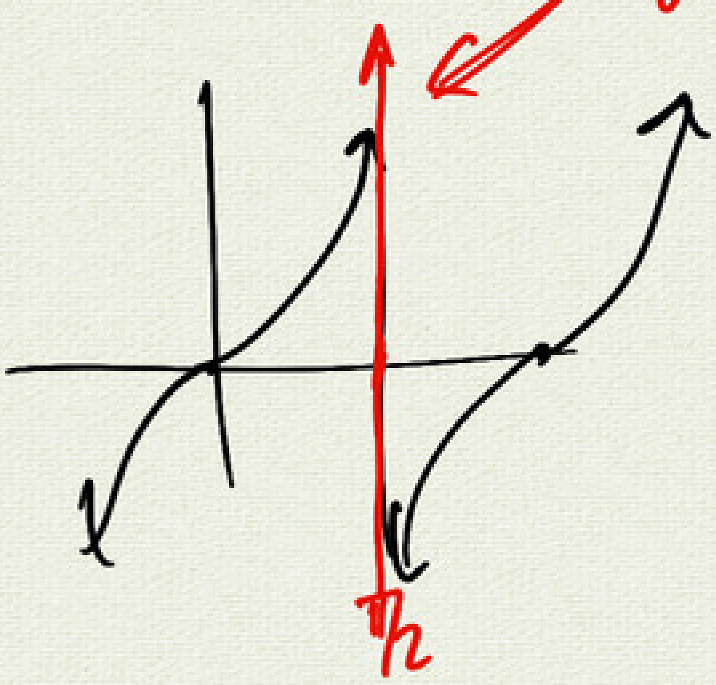
discontinuities

continuous



draw without taking pen off paper

asymptote: infinite discontinuity at $x = \pi/2$ $(+k\pi)$



$f(x) = \tan x$

$$\lim_{x \to \frac{\pi}{2}^-} f(x) = \infty$$

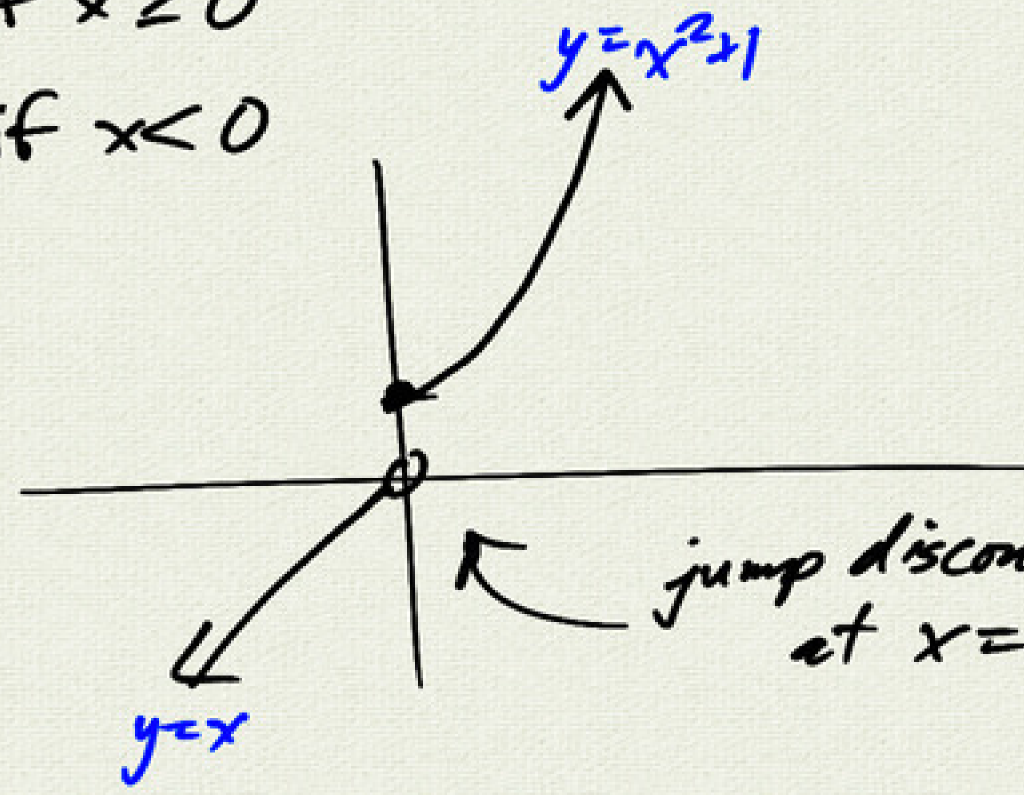
$$\lim_{x \to \frac{\pi}{2}^+} f(x) = -\infty$$

could also write:

$$\lim_{x \to \frac{\pi}{2}^-} \tan(x) = \infty$$

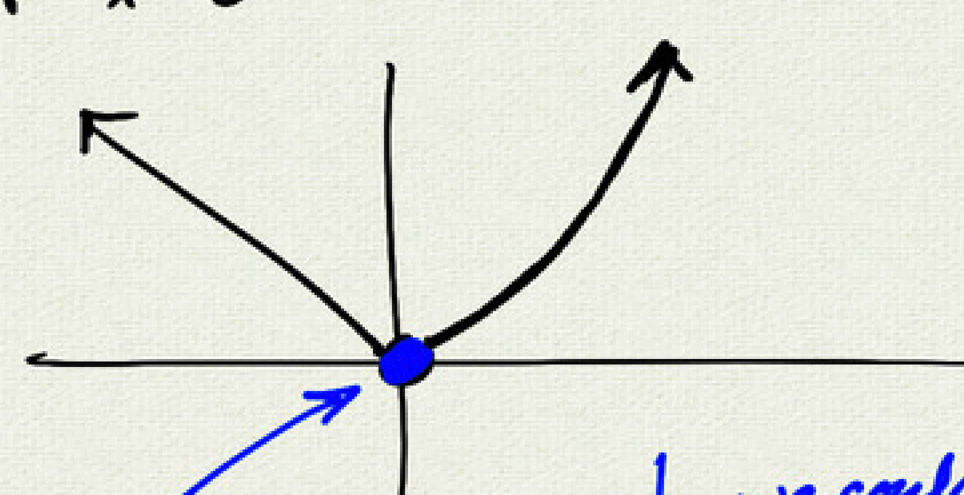
$$\lim_{x \to \frac{\pi}{2}^+} \tan(x) = -\infty$$

$$f(x) = \begin{cases} x^2+1 & \text{if } x \geq 0 \\ x & \text{if } x < 0 \end{cases}$$



jump discontinuity at $x=0$

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

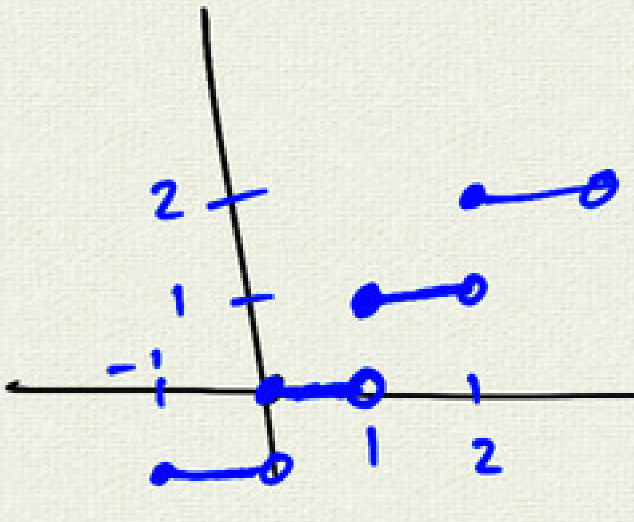


removable discontinuity

we could redefine $f(0) = 0$

$f(x) = \text{int}(x)$ (greatest integer function)

$(= \lfloor x \rfloor)$ "the biggest integer less than or equal to x"



step function

$f(0)=0$

$f(.1)=0$

$f(.5)=0$

$f(.9)=0$

$f(1)=1$

$f(-1.1)=-2$

domain: $\mathbb{R}$

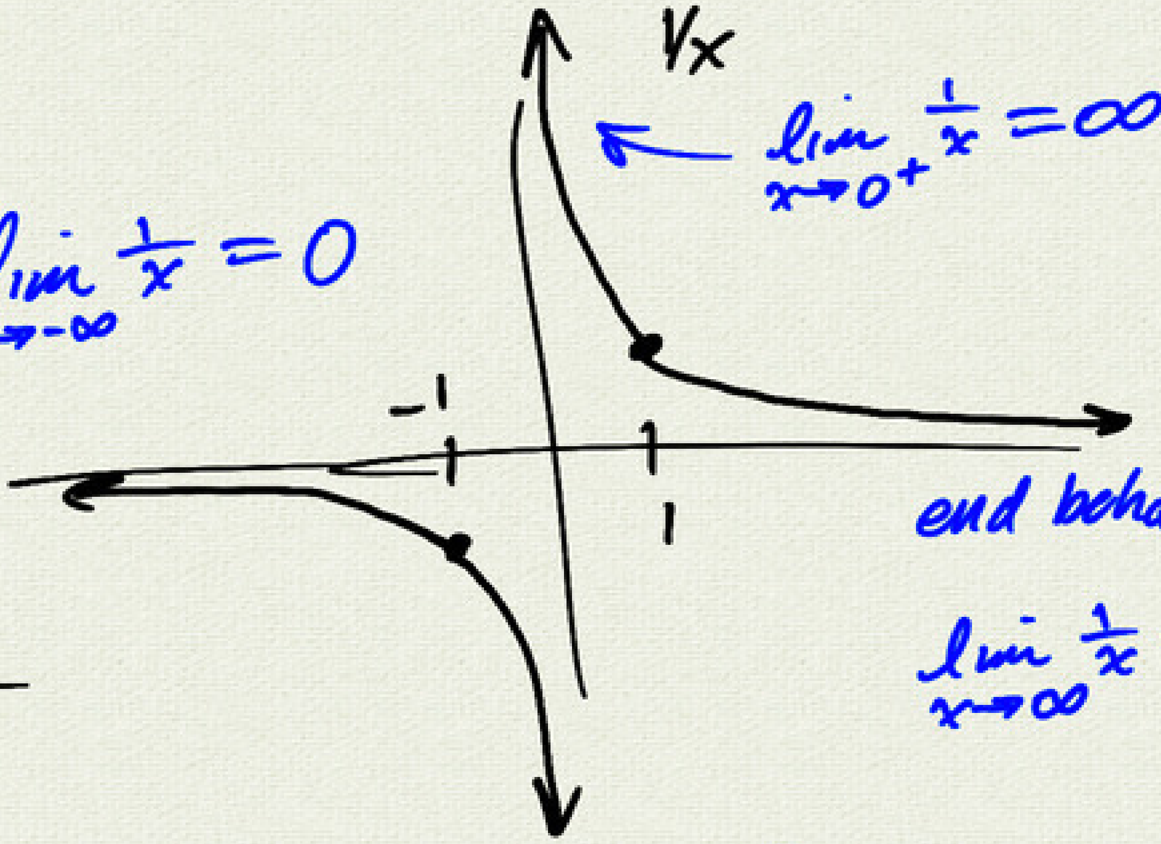
range: $\mathbb{Z}$

jump discontinuity at $x=k$ $(k \in \mathbb{Z})$

$h(x) = \dfrac{1}{x}$

x	$\frac{1}{x}$
1	1
10	.1
100	.01
1000	.001
.1	10
.01	100
.001	1000

$\lim\limits_{x \to -\infty} \frac{1}{x} = 0$



$\lim\limits_{x \to 0^+} \frac{1}{x} = \infty$

end behavior

$\lim\limits_{x \to \infty} \frac{1}{x} = 0$

$\lim\limits_{x \to 0^-} \frac{1}{x} = -\infty$