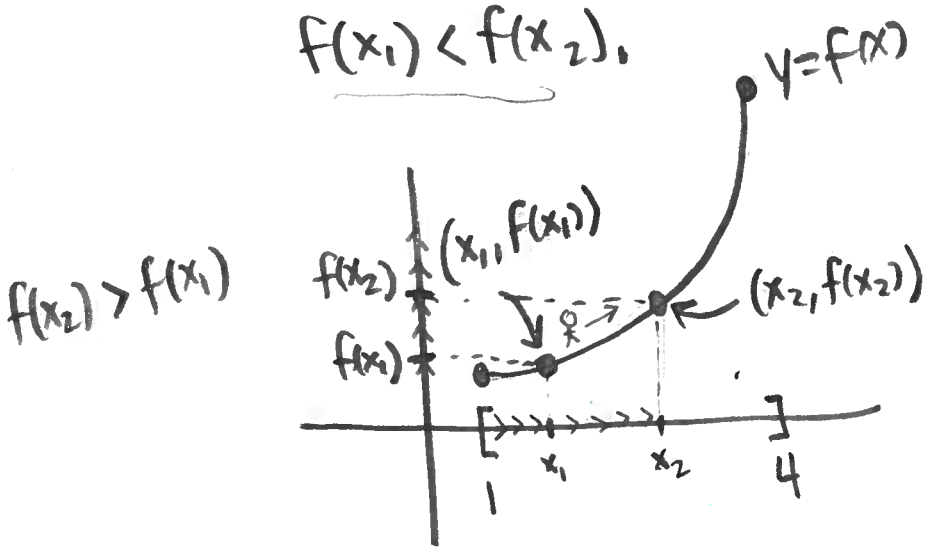
Increasing and decreasing functions

open interval (endpoints NOT included)

A function is called increasing on (a,b) if for any x_1, x_2 in (a,b) with $x_1 < x_2$,

$f(x_1) < f(x_2)$.

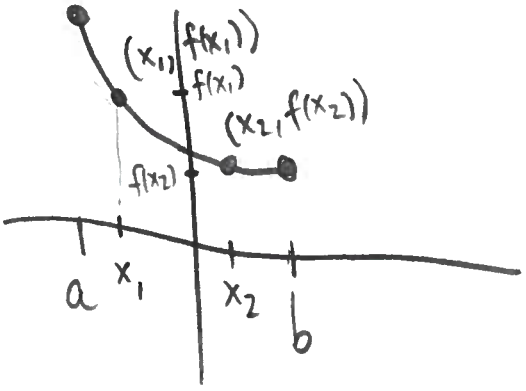


We say f is increasing on $(1,4)$.

Visually: this means that when going left-to-right on x-axis in (a,b), f is increasing if it is always "going up"

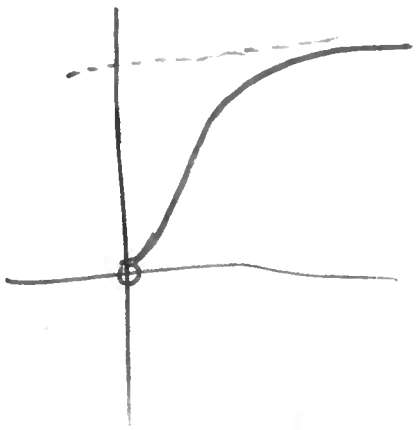
f is decreasing on (a,b) if for any x_1, x_2 in (a,b)

$f(x_1) > f(x_2)$



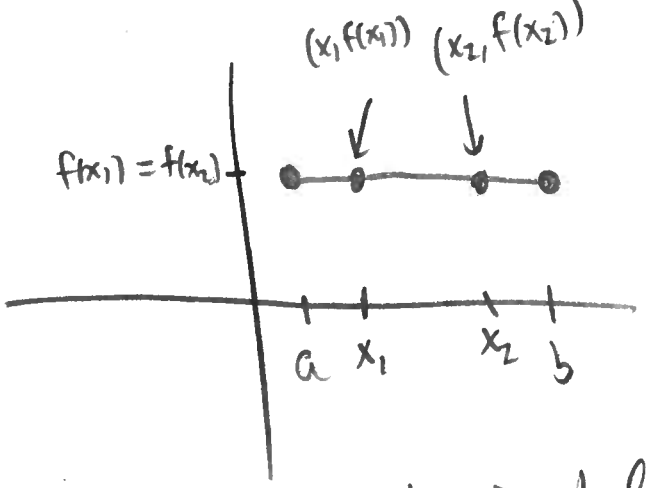
$f(x_1) > f(x_2)$

Visually: if when going left-to-right along the graph you go downhill, then it is decreasing there



We say f is constant on (a,b) if

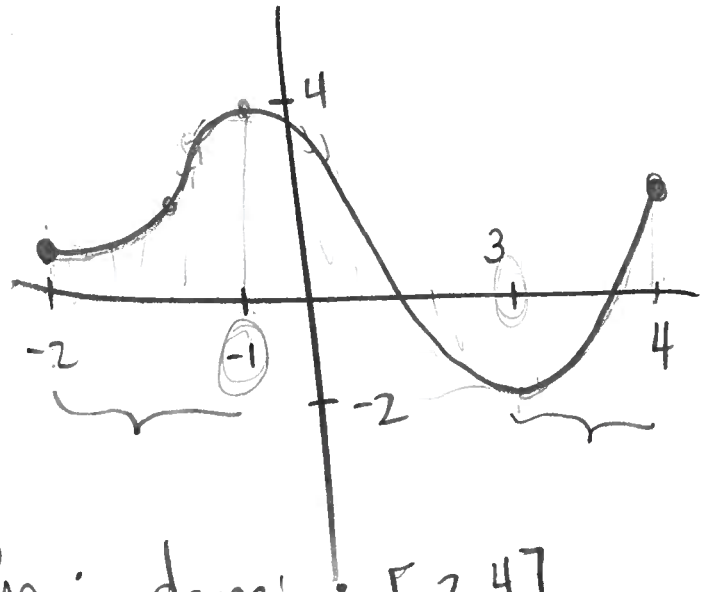
for any x_1, x_2 in (a,b) $\quad f(x_1) = f(x_2)$



Visually: graph is horizontal

Ex: Identify domain and where f is increasing & decreasing.

always a question of x-axis stuff

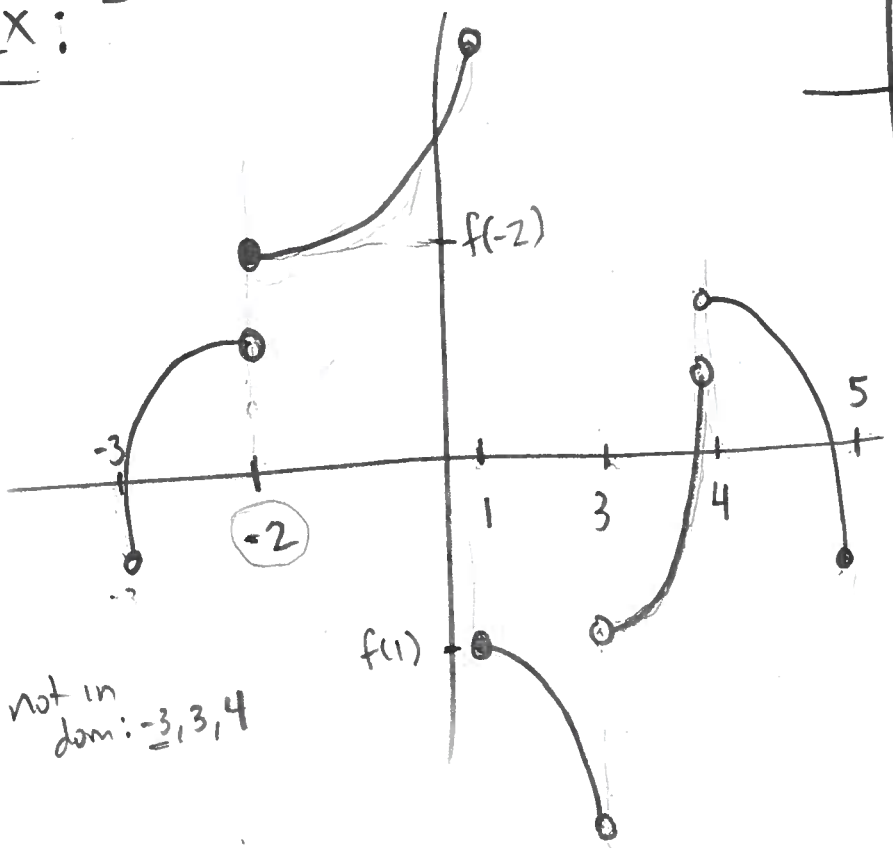


Soln: domain: $[-2, 4]$

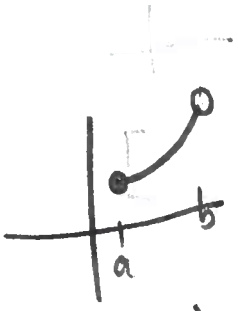
increasing: $(-2, -1) \cup (3, 4)$

decreasing: $(-1, 3)$

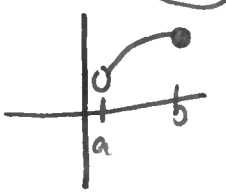
Ex: Identify domain, where inc + dec



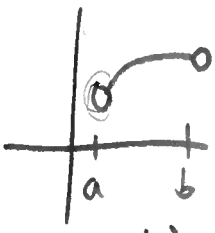
not in dom: -3, 3, 4



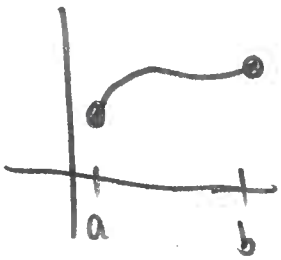
[a, b)



(a, b]



(a, b)

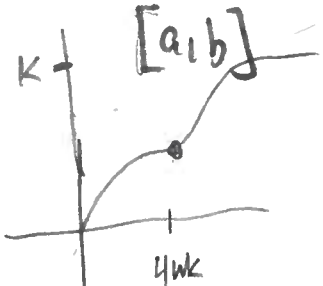


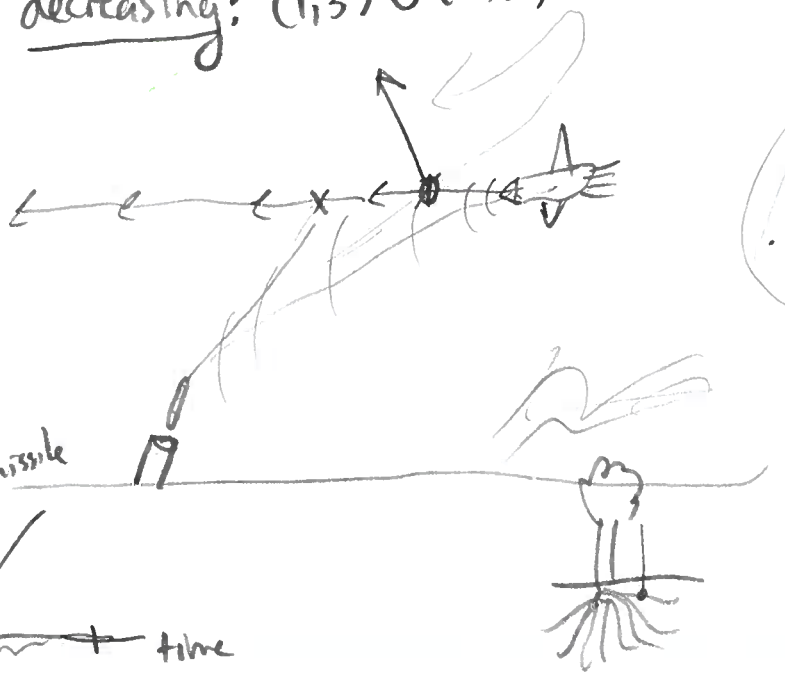
[a, b]

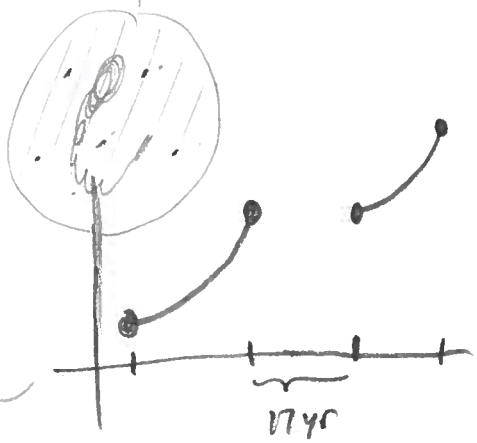
domain: $(-3,3) \cup (3,4) \cup (4,5]$

increasing: $(-3,1) \cup (3,4)$

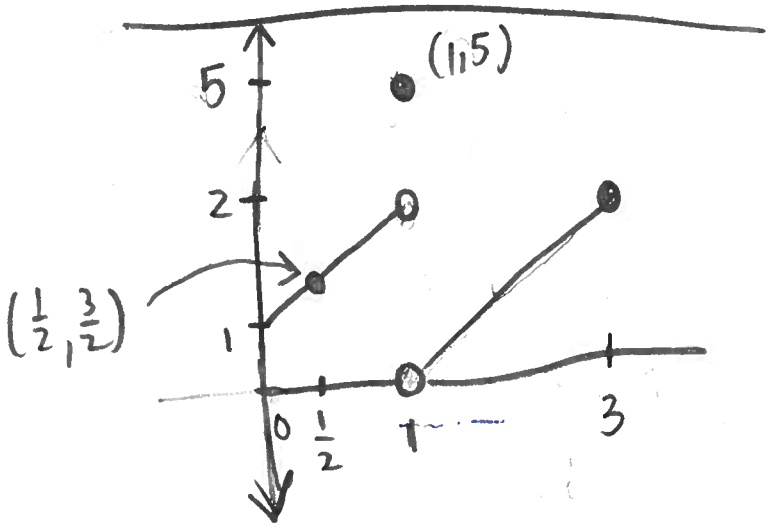
decreasing: $(1,3) \cup (4,5)$







Piecewise functions



$f: [0,3] \to \mathbb{R}$

$$f(x) = \begin{cases} x+1 & ; 0 \le x < 1 \quad [0,1) \\ 5 & ; x = 1 \quad \{1\} \\ x-1 & ; 1 < x \le 3 \quad (1,3] \end{cases}$$

~~3 pieces~~ 3 pieces

domain of pieces

$f(\frac{1}{2}) = (\frac{1}{2}+1) = \frac{3}{2}$

↑ What piece is $x=\frac{1}{2}$ in? (1st piece)

$f(1) = 5$

↑ What piece is $x=1$ in? (2nd piece)

$f(2) = 2-1 = 1$

↑ What piece is $x=2$ on? (3rd piece)