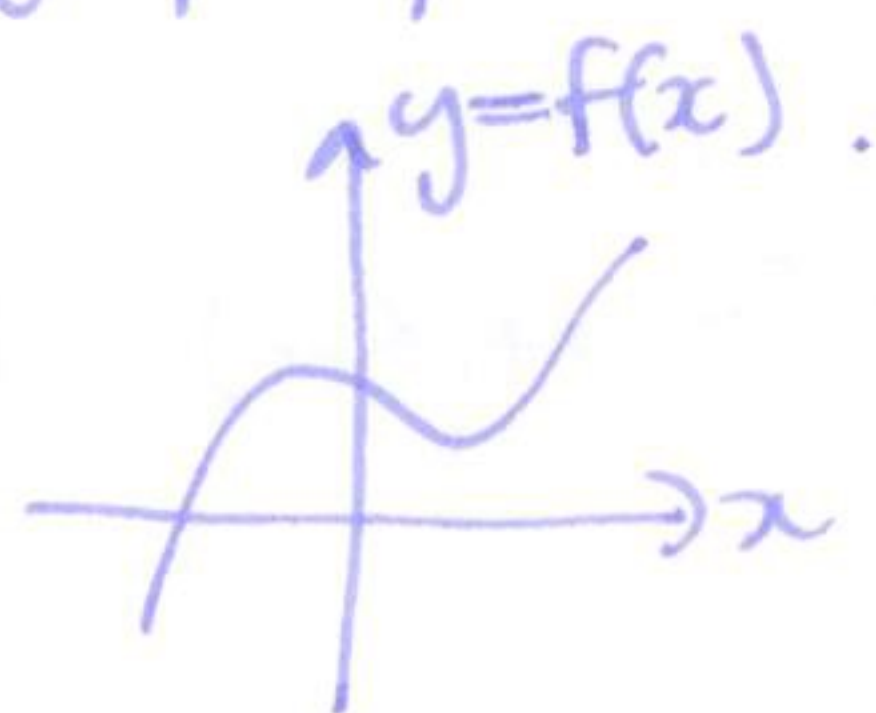


last time: function, graphs/pictures of functions

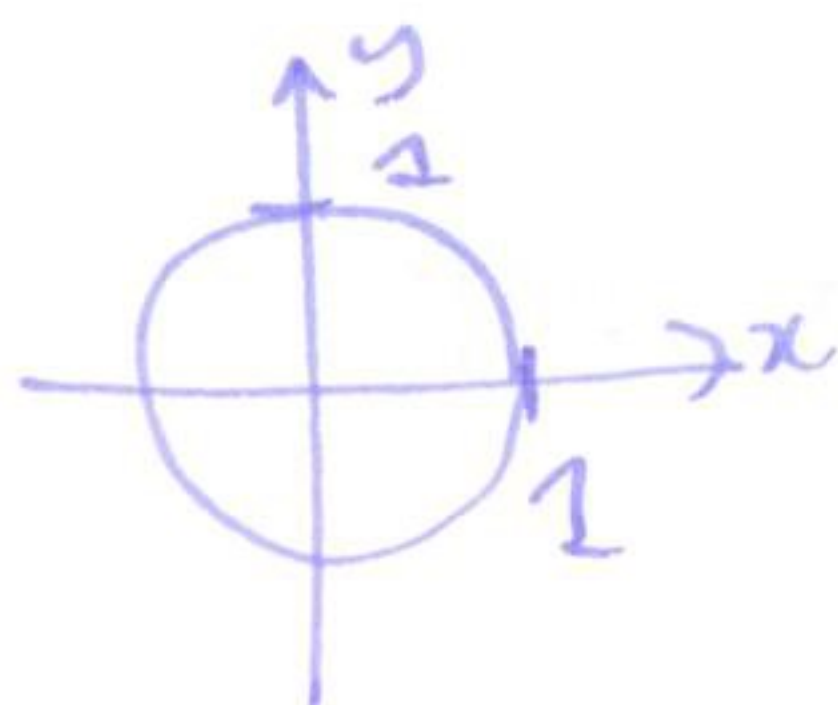
$$f: \mathbb{R} \rightarrow \mathbb{R}$$

$$x \mapsto f(x)$$



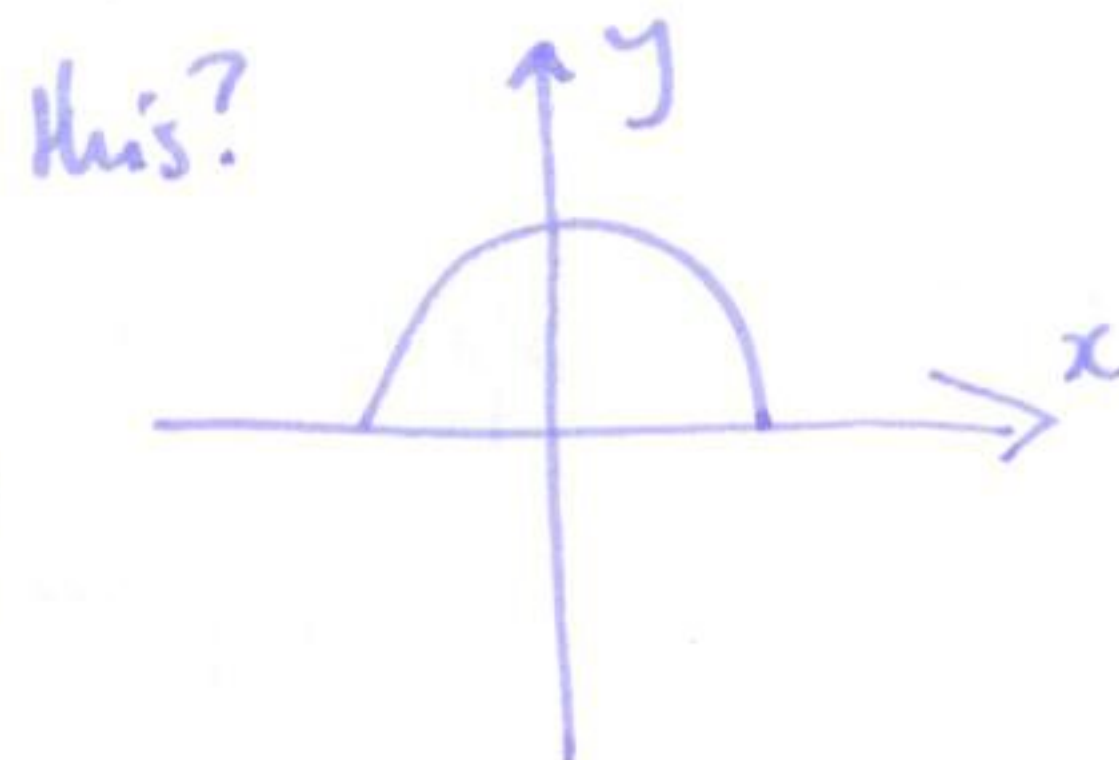
webworks
sun midnight

Q.

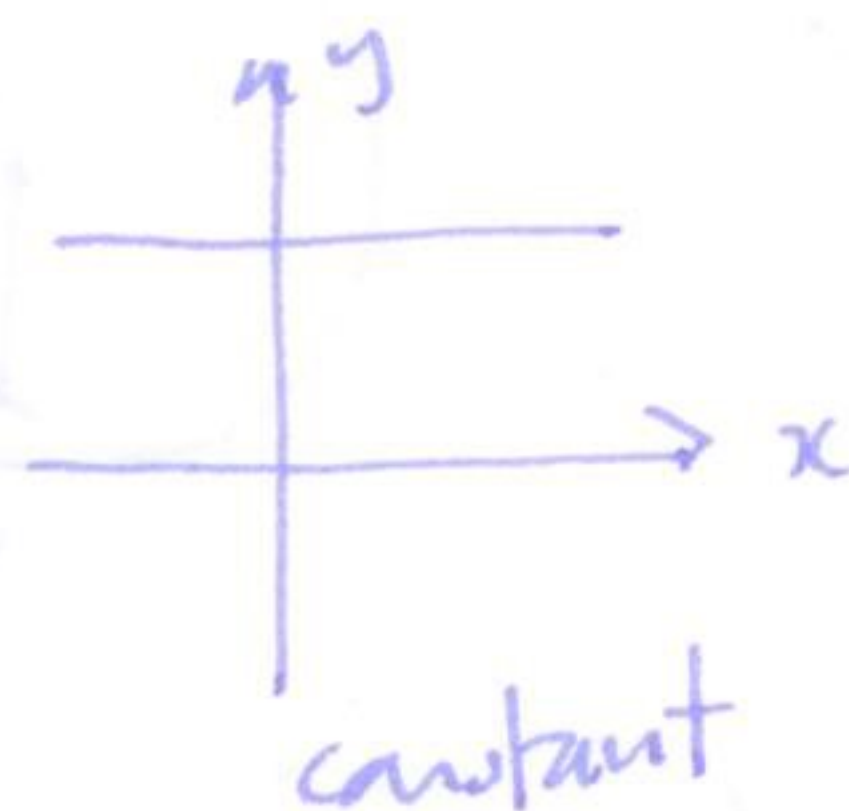
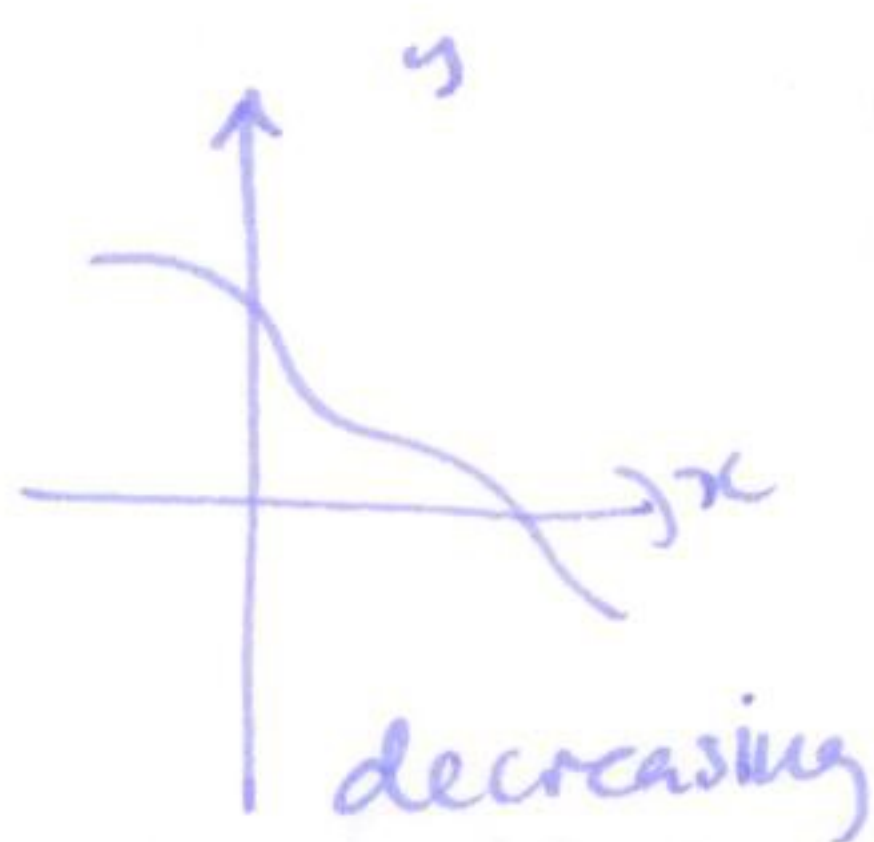
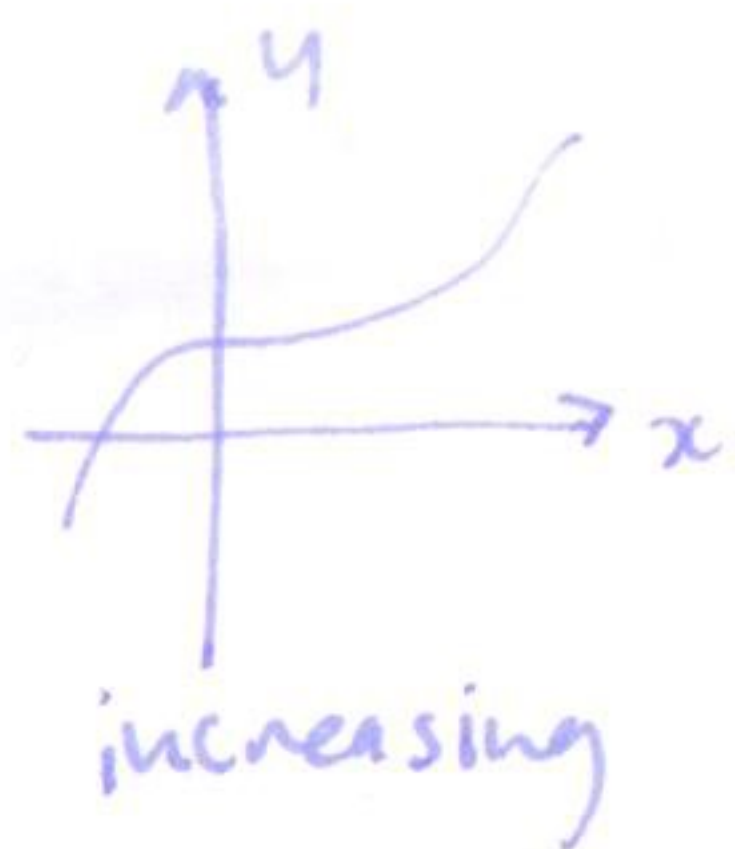


is this a picture
of a function?

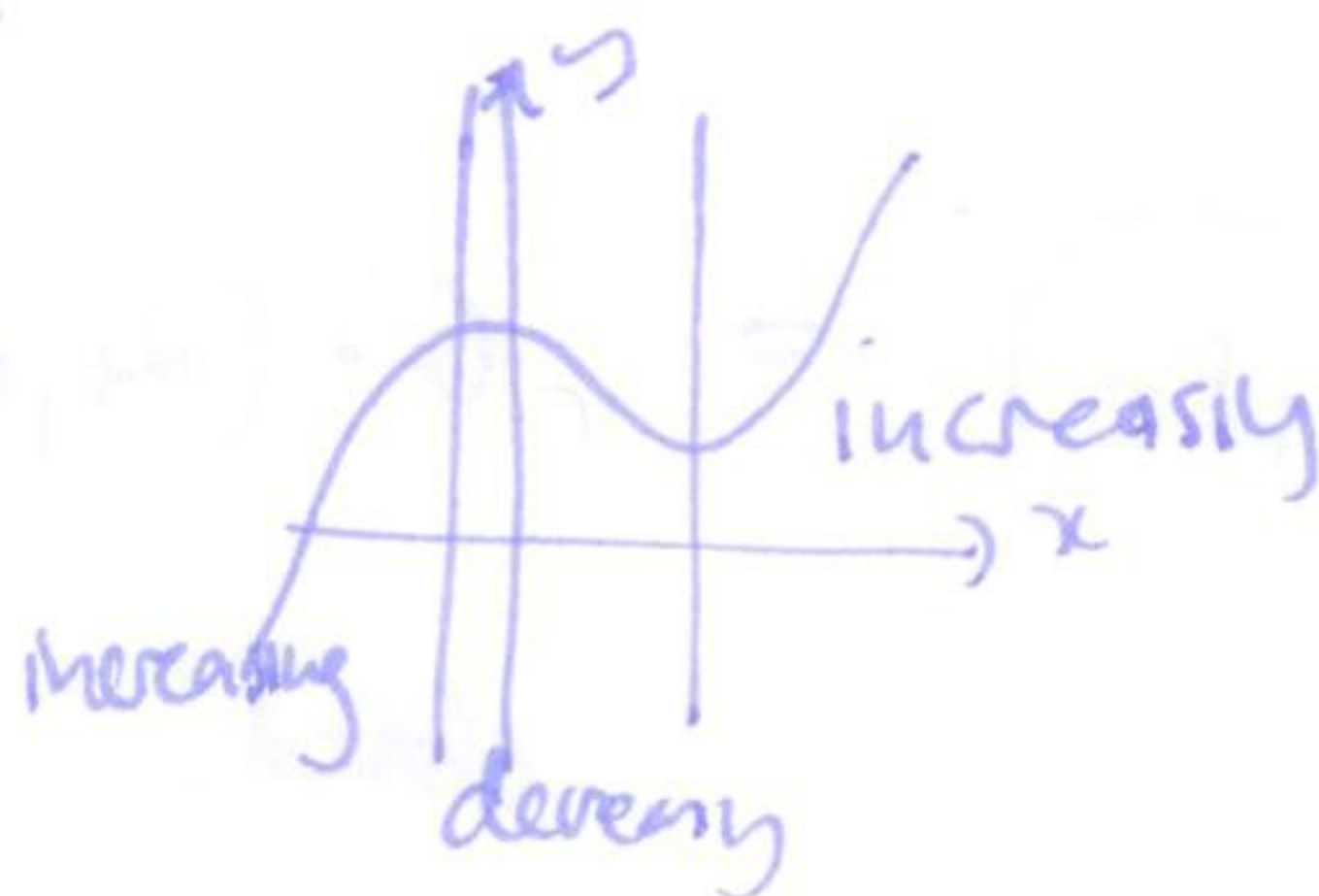
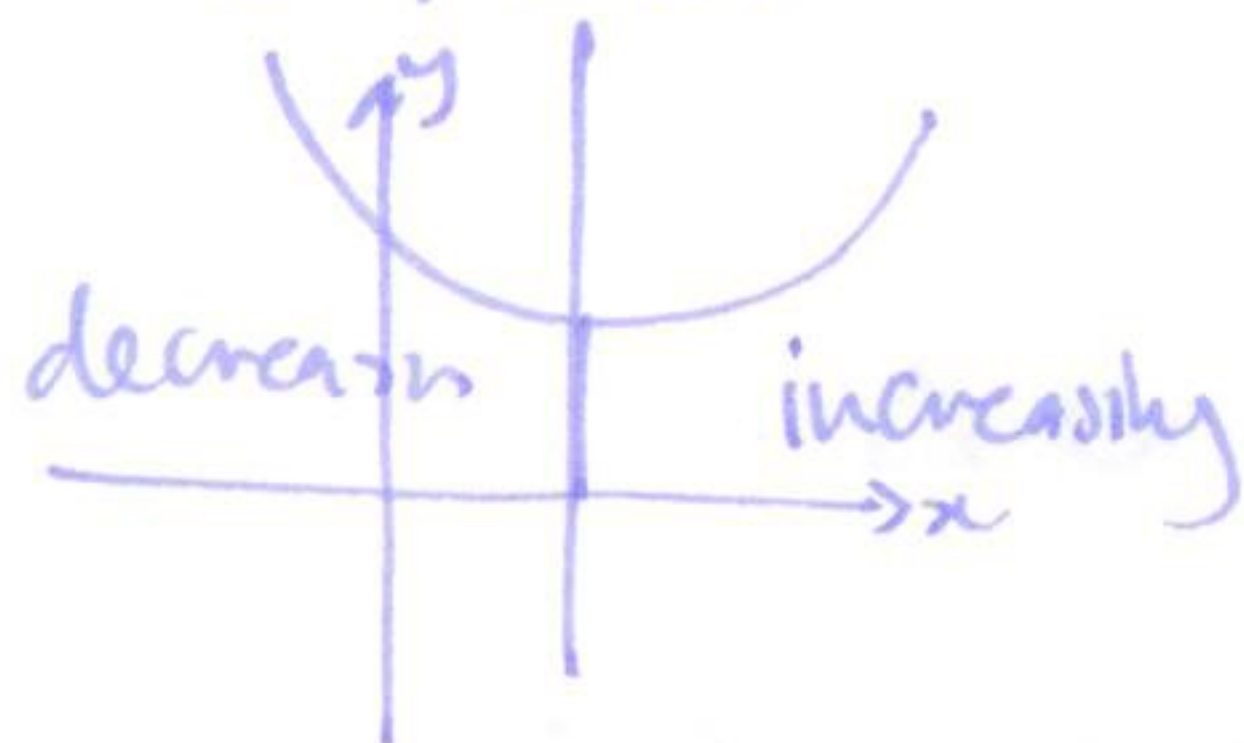
what is domain and range?
max value of f ?
where is max?



§2.1 Increasing, decreasing, constant functions



more complicated:



Def let (a,b) be an open interval.

a function f is increasing on (a,b) if $f(x) \geq f(y)$ for all $x > y$

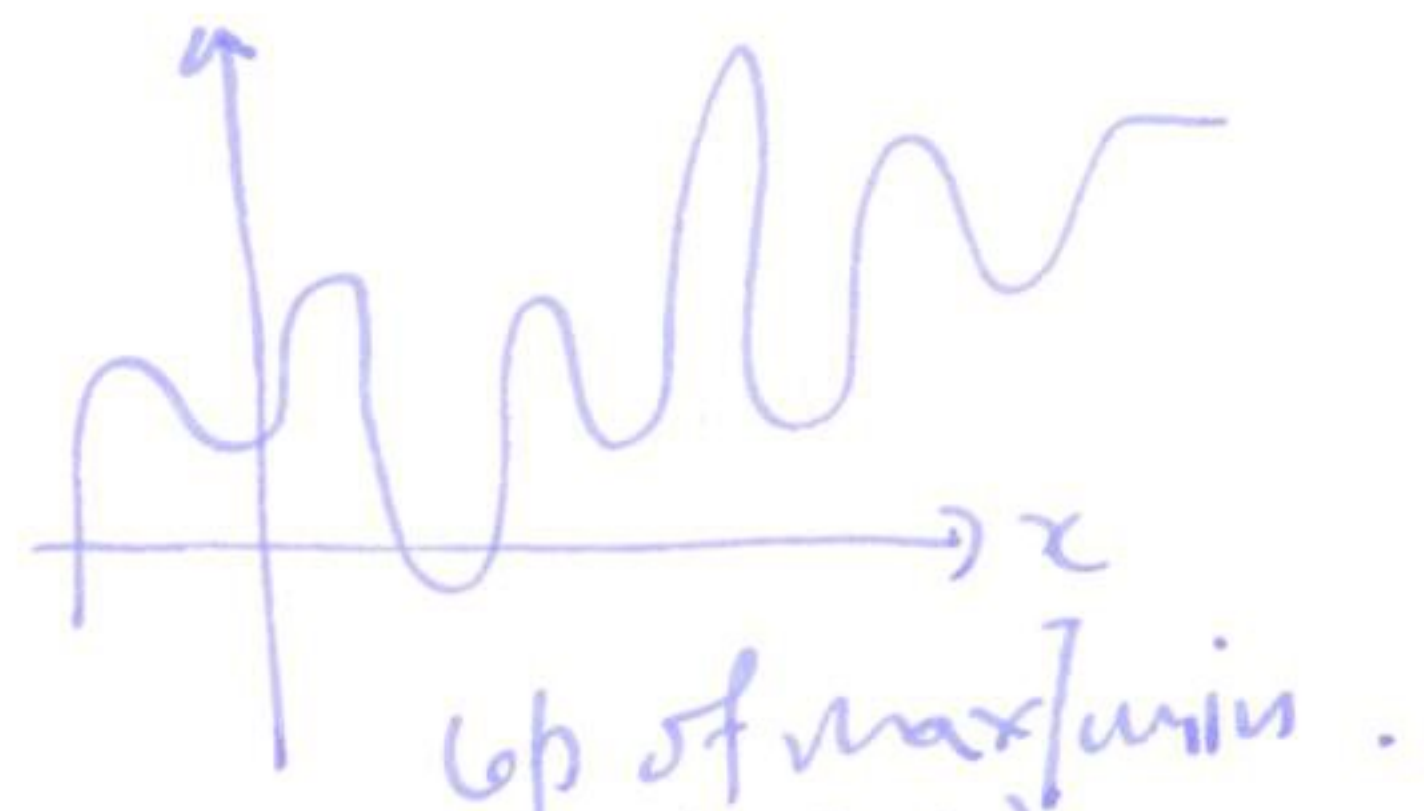
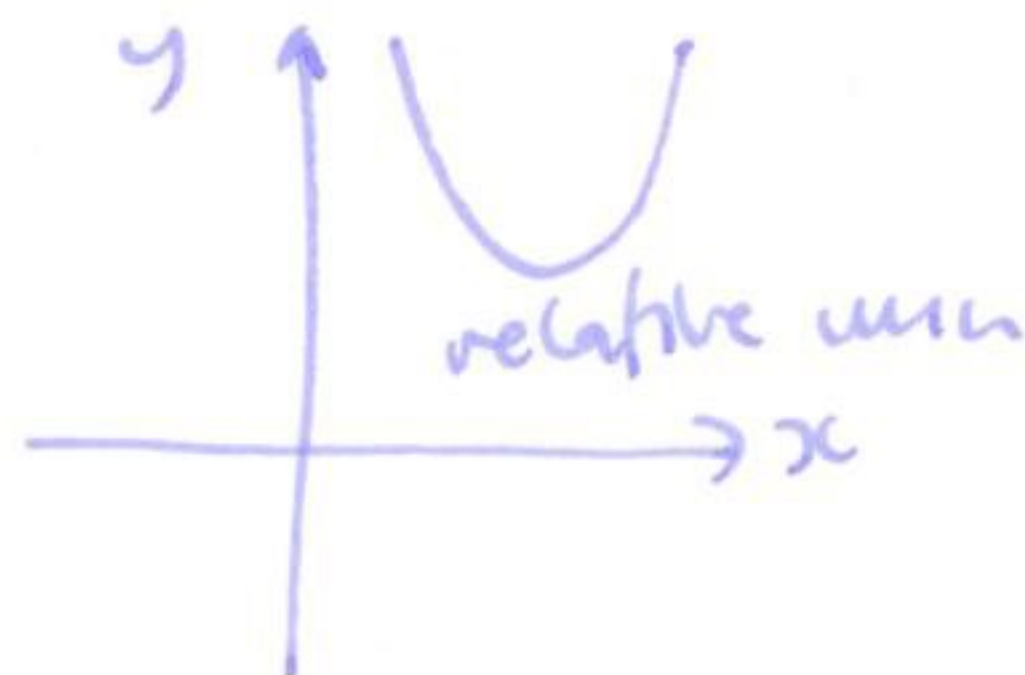
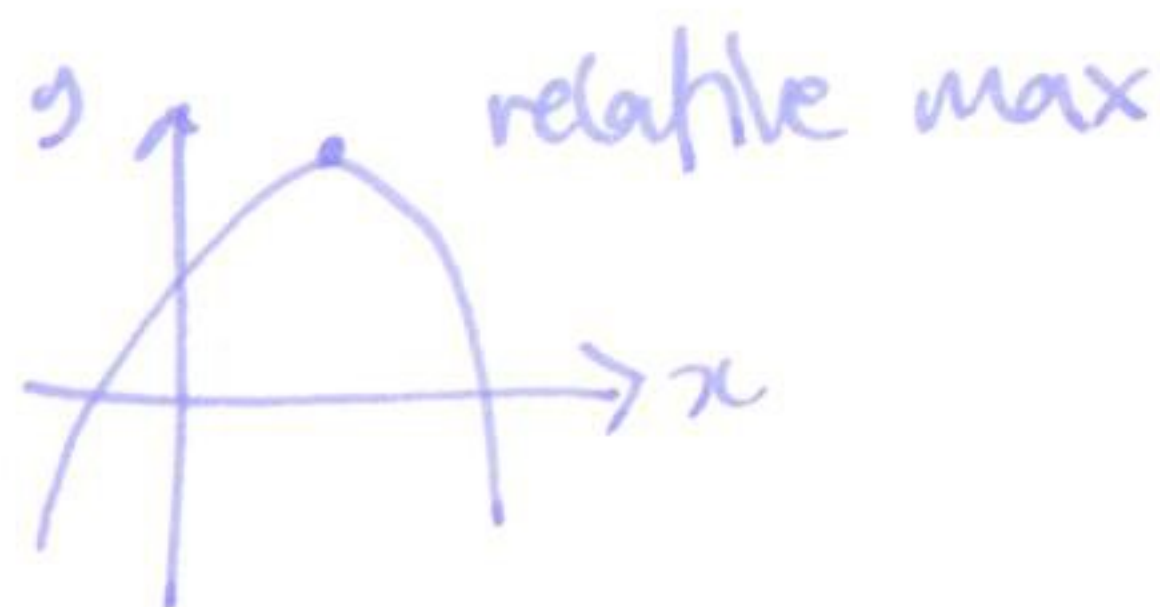
strictly increasing

$$f(x) > f(y) \quad x > y$$

decreasing
strictly decreasing
constant

$$\begin{aligned} f(x) &\leq f(y) & x > y & \textcircled{9} \\ f(x) &< f(y) & x > y \\ f(x) &= f(y) & \text{for all } x, y \in (a, b) \end{aligned}$$

relative max/min

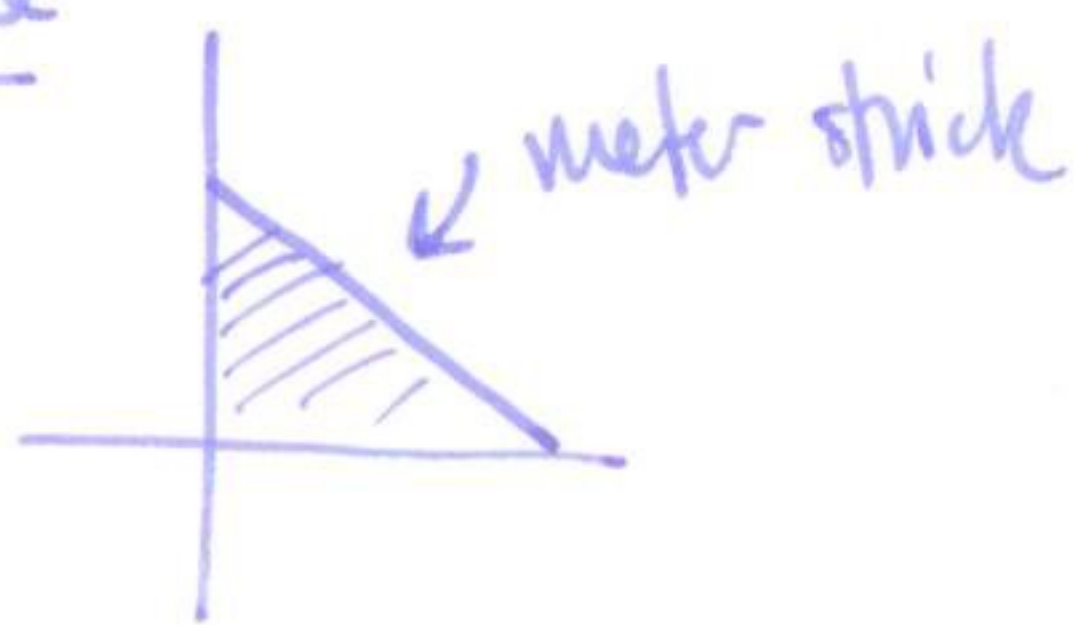


a point c is a relative min if there is an open interval (a, b) containing c s.t. $f(c) \leq f(x)$ for all $x \in (a, b), x \neq c$.

relative max

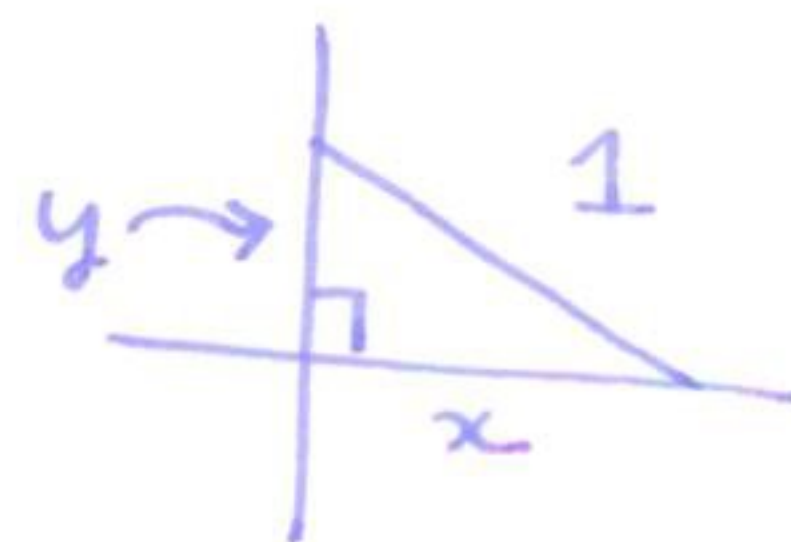
$$f(c) \geq f(x) \text{ for all } x \in (a, b), x \neq c.$$

Example



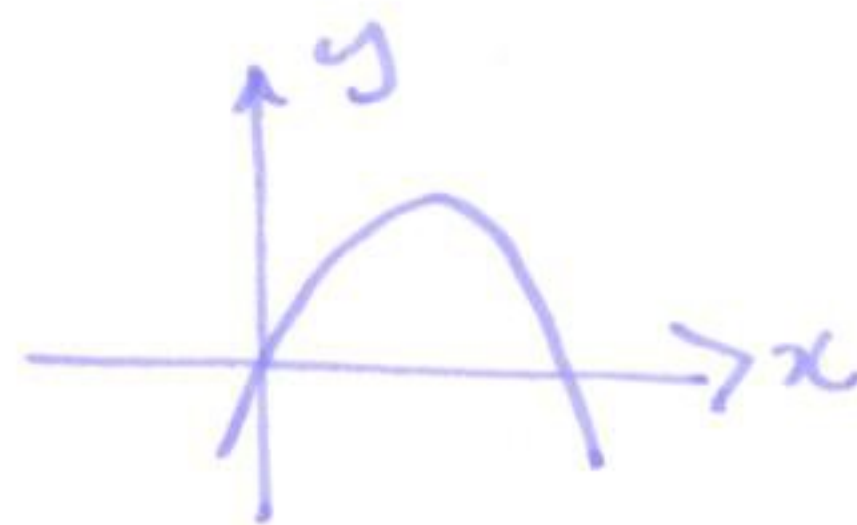
how much area?

$$= \frac{1}{2} \sqrt{x^2(1-x^2)}.$$



$$f(x) = \text{area of triangle} = \frac{1}{2} \sqrt{1-x^2} = \frac{1}{2} \sqrt{1-x^2} \quad x^2 + y^2 = 1. \quad y = \sqrt{1-x^2}.$$

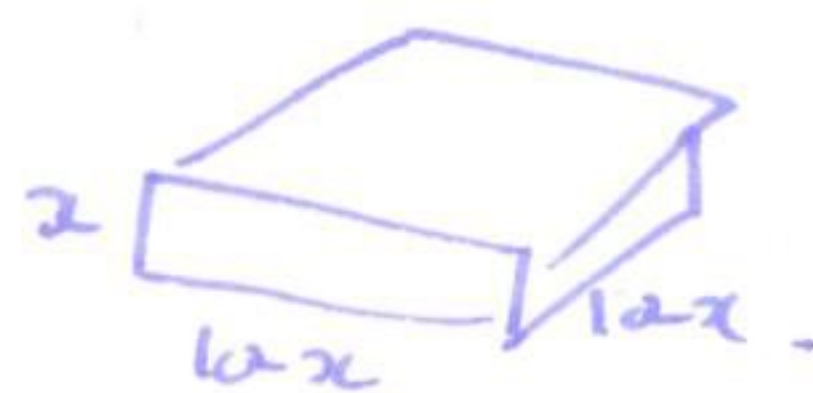
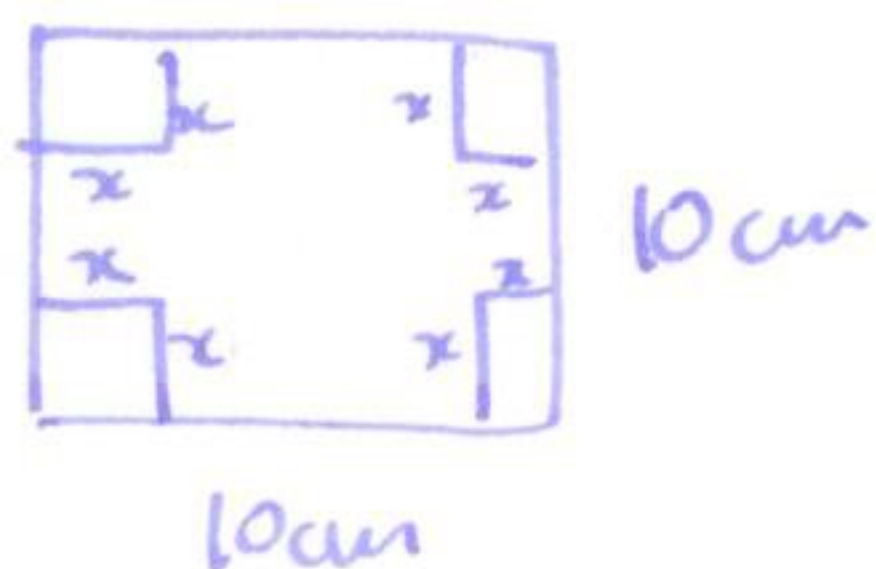
domain? range? graph:



draw on calculator:
 find approx solution.

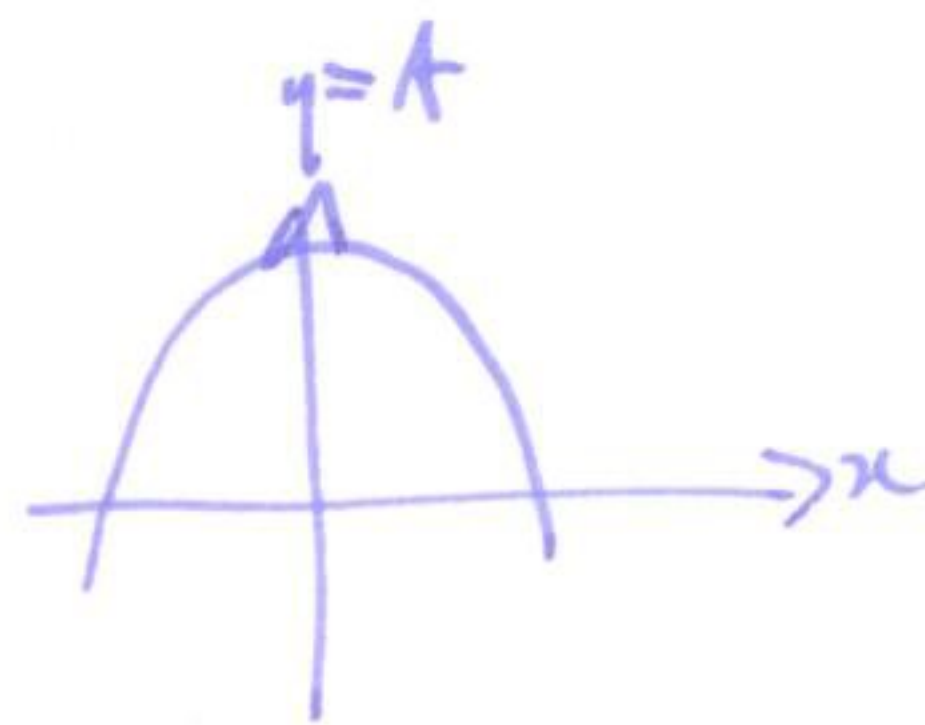


Example make a box



volume $V = x(10x)^2$

area $A = 100 - 4x^2$



example sketch find max/min of

$f(x) = x^2 + x + 1$

"

$(x + \frac{1}{2})^2 + \frac{3}{4}$

"

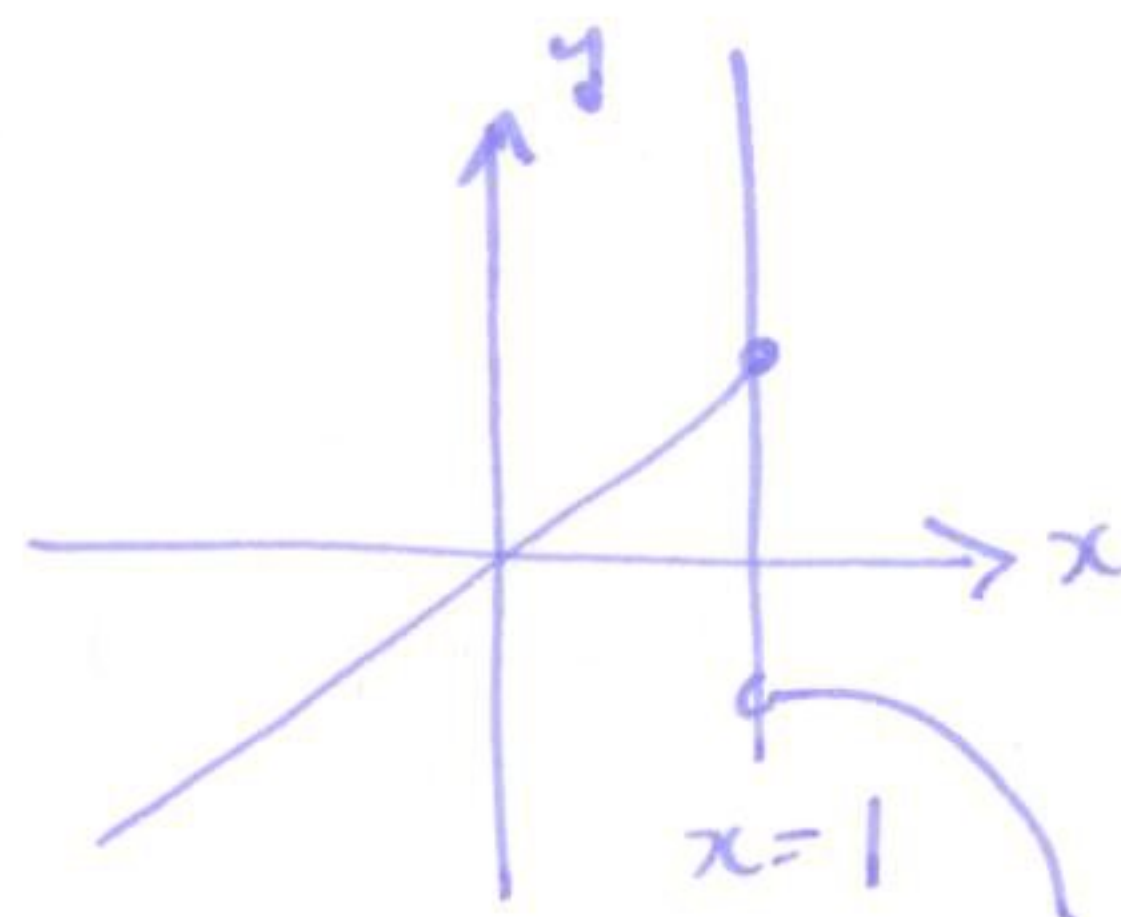
$x^2 + x + \frac{1}{4} + \frac{3}{4}$



so min $\frac{3}{4}$ occurs at $x = -\frac{1}{2}$.

Piecewise functions

example $f(x) = \begin{cases} x & x \leq 1 \\ -x^2 & x > 1 \end{cases}$



combinations of functions

$f(x), g(x)$ can combine them to form

domain and range?

$f(x) + g(x)$

$f(x) - g(x)$

$f(x)g(x)$

$f(x)/g(x)$

~~exa~~ domain = intersection of domains

and then want x s.t. $g(x) \neq 0$ in $f(x)/g(x)$.

Example

$f(x) = x + 2$

$g(x) = \sqrt{x-1}$