9/1/2022

Evaluating a function

§ 1.2 Cont... evaluate a func

Ex

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

then $f(2) = 2^2 - 2(2) + 3 = 3$

$f(-a) = (-a)^2 - 2(-a) + 3$

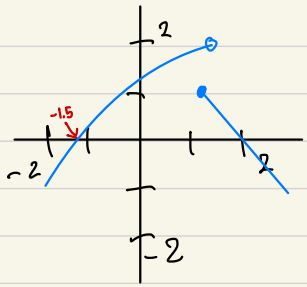
$= a^2 + 2a + 3$

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

$= x^2 + 4x + 4 - 2x - 2 + 3$

$= x^2 + 2x + 5$

Ex: graph



$f(0) = 1.5$

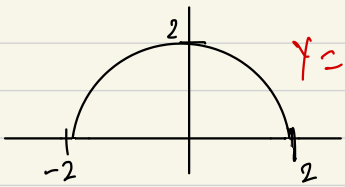
$f(1) = 1$

If $f(x) = 0$, find x

Ans: $x = 2$, $x = -1.5$

Domain and Range

Ex:

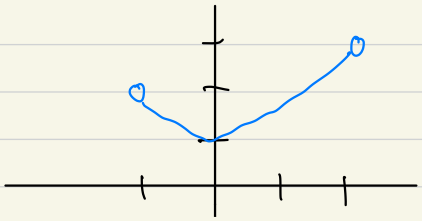


$y = f(x)$

$\text{dom}(f) = [-2, 2] = \{x \mid -2 \le x \le 2\}$

$\text{ran}(f) = [0, 2] = \{y \mid 0 \le y \le 2\}$

Ex

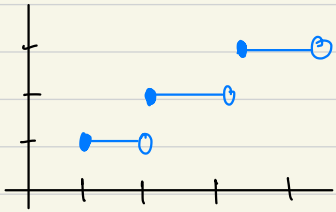


$dom(f) = (-1, 2) = \{x \mid -1 < x < 2\}$

$ran(f) = [1, 3) = \{y \mid 1 \leq y < 3\}$

If $(a, b]$ then $a < b$ must be true

ex:



$dom(f) = [1, 4) = \{x \mid 1 \leq x \leq 4\}$

$ran(f) =$ no interval $= \{y \mid y = 1, 2, 3\} = \{1, 2, 3\}$

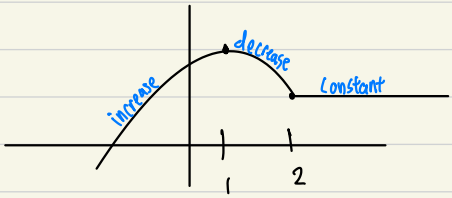
Ex

$$f(x) = \frac{x^2 + 4x + 1}{x - 2}$$

$dom(f) = \{x \mid x \neq 2\} = (-\infty, 2) \cup (2, \infty)$

$ran(f) = ?$

§ 1.3
More on Functions

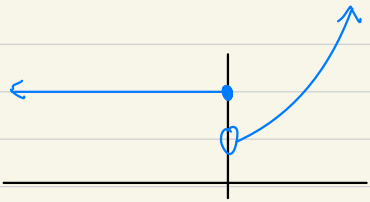


f is increasing on $(-\infty, 1)$,
decreasing on $(1, 2)$,
& constant on $(2, \infty)$

Def increasing

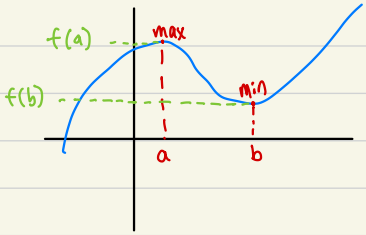
A func is increasing on an interval I if $f(x_1) < f(x_2)$ for all $x_1 < x_2 \in I$

EX



f is increasing on $(0, \infty)$
decreasing on $\varnothing$ empty set (or $\{\}$)
& constant on $(-\infty, 0)$

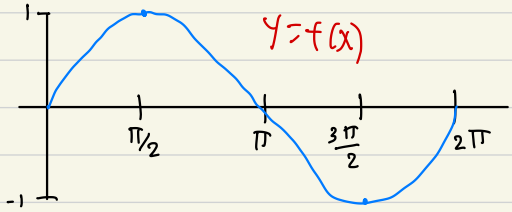
Relative Max & min



$f(a)$ = relative min
$f(b)$ = relative max

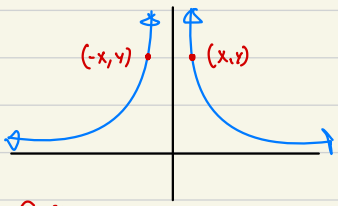
Def $f(a)$ is a relative max if $f(a) > f(x)$ for all x near a

EX



rel max $f(\pi/2) = 1$
rel min $f(3\pi/2) = -1$
ran(f) $= [-1, 1]$

Symmetry



symmetric with respect to y axis
if (x,y) is on the graph then $(-x,y)$ is also on the graph.

Test: Substitute $-x$ for x, if results in equivalent equation, then its symmetric.

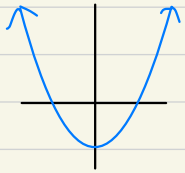
ex

$y = x^2 - 1$

(sub $-x$ for x)

$y = (-x)^2 - 1 = x^2 - 1$

symmetric with respect to (w.r.t.) y axis



EX

$x - y^2 = 1$

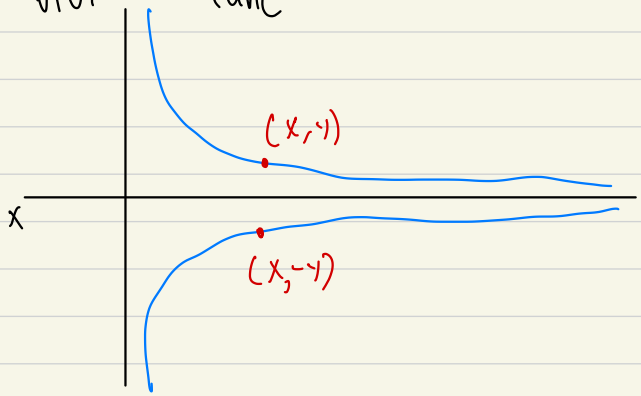
sub $-x$ for x

$(-x) - y^2 = 1$

$-x - y^2 = 1$

not symmetric w.r.t. the y axis

not a func



if (x, y) is on graph then $(x, -y)$ on graph

Test

sub $-y$ for y

Ex

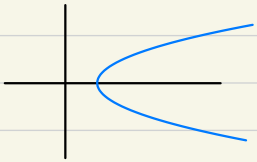
$x - y^2 = 1$

Sub $-y$ for y

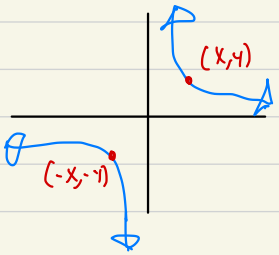
$x - (-y)^2 = 1$

$x - y^2 = 1$

Symm. w.r.t. the x axis



Ex



Symm. w.r.t. the origin

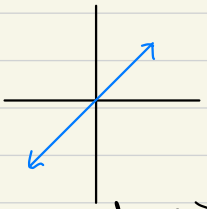
If (x,y) on graph $(-x,-y)$ on graph

Test

Sub $-x$ for x and $-y$ for y

same eqn ✓

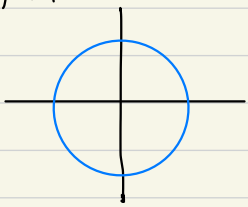
$y = x$



$-x = -y \rightarrow x = y$

EX

$x^2+y^2=1$



Sub x, -x

$(-x)^2+y^2=1$

$x^2+y^2=1$ ✓

Sub y, -y

$x^2+(-y)^2=1$

$x^2+y^2=1$ ✓

Sub x & y

$(-x)^2+(-y)^2=1$

$x^2+y^2=1$ ✓