Real functions

1) Domain

(a) Polynomial function

domain $= \mathbb{R}$

(b) Fractional function: $y = \frac{f(x)}{g(x)}$

$g(x) \neq 0$

domain $= \mathbb{R} - \{$ Zeros of deno. $\}$

(c) Rootal function

$y = \sqrt[odd]{g(x)}$ $\quad D = \mathbb{R}$

$y = \sqrt[even]{g(x)}$ $\quad D =$ interval $g(x) \geq 0$

operations "$y = f(x) \pm g(x)$

$D = D_1 \cap D_2$ $\quad$ common domain

$y = \frac{f(x)}{g(x)}$ $\quad D = [D_1 \cap D_2] - \{$ deno $\}$

Composite function $\quad (f \circ g)(a)$

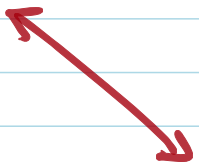
$(f \circ g)(x) = f[g(x)]$

Domain range $\quad$ Rule graphically $\quad$ x-axis y-axis

graphs

1. linear function

$f(x) = x$ 

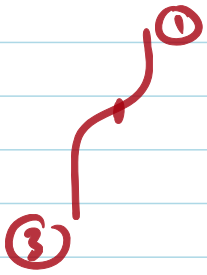
$f(x) = -x$ 

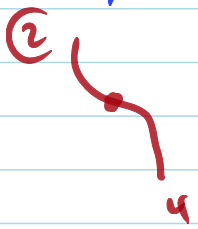
2. Quad.

$f(x) = x^2$ 

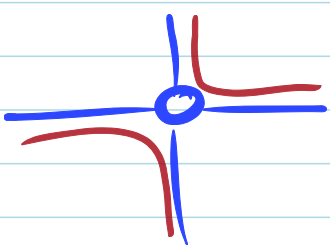
$f(x) = -x^2$ 

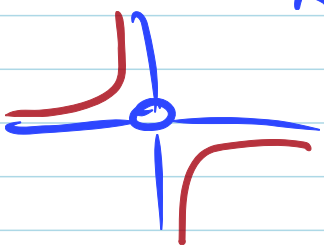
3. Cubic

$f(x) = x^3$ 

$f(x) = -x^3$ 

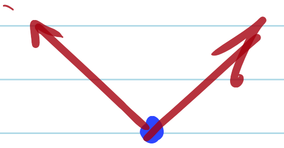
4. fractional

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

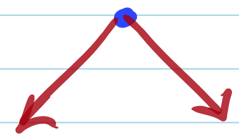
$f(x) = \frac{-a}{x}$ 

Abs

$f(x) = |x|$



$f(x) = -|x|$

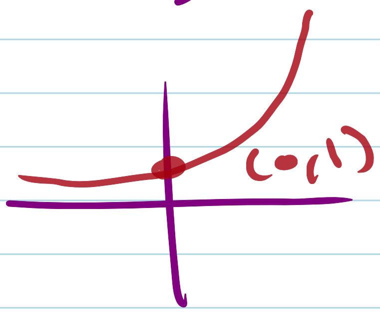


exponential

$f(x) = a^x$

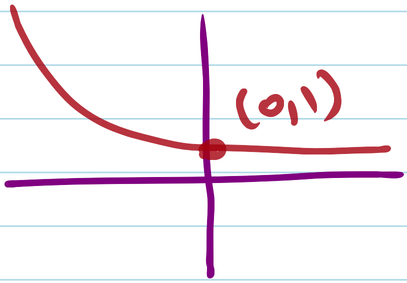
$a > 1$

inc



$f(x) = a^x$

$0 < a < 1$



$$f(x) = a(dx \pm b)^n + c$$

a: توسع وتضيق واشارة

Vertex (معكوس اشارة ال b , نفس اشارة c)

if $d \neq 1$ (معكوس اشارة ال $\frac{b}{d}$, نفس اشارة c)

$f(x) = \cancel{4}(x - 3)^2 + 8$ $\quad (3, 8)$

$f(x) = -12(3x + 6)^3 + 2$ $\quad \left(\frac{-6}{3}, 2\right)$

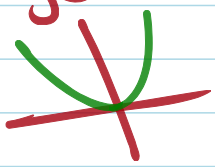
$(-2, 2)$

even odd

Graph

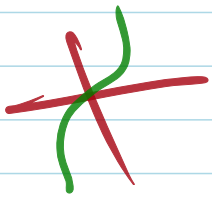
even

sym about y-axis



odd

sym about origin



Alg. $f(x)$

$f(-x) \rightleftarrows f(x)$ even

$f(-x) \rightleftarrows -f(x)$ odd

Obv.

$\neq f(x) \neq -f(x)$

N.I.N.

x^2, x^4, a

Cos

even

sin, tan

x^1, x^3, x^5 odd

$x^2 \cos x$

$0 \quad +0$

$x \sin x$

$0 \quad 0$

$x^3 \tan x$

$0 \quad 0$

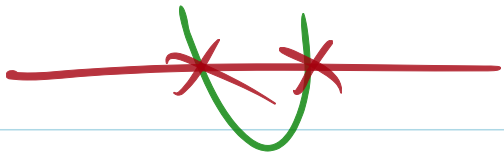
$f(x) = \frac{\tan x}{x^2}$

(E) × (E) = (E)

(O) × (O) = (E)

(E) × (O) = (O)

one-to-one



even not one-to-one

$f(a) = f(b)$

only if

$a = b$

Abs - equation

$|x| = -ve$ $\quad \phi$

$|x| = 0$

$|x| = +ve$

① Condi: $x \geq 1$ $\quad x <$

② Solve

③ Check

S.C. $\quad |\ |\ = |\ |$

by Squaring

ineq

$|\ |\ < 0^{-ve}$ $\quad \phi$

$|\ |\ > 0^{-ve}$ $\quad R$

$|x| < a$ (+ve)

$-a < x < a$

S.S. $=]-a, a[$

$|x| > a$ (+ve)

$x > a$ | $x < -a$

S.S. = $\mathbb{R}$ - (مفتوحة)