GATE
DATA SCIENCE AND AI

Calculus and Optimization

SINGLE VARIABLE CALCULUS

Lecture No.- 01

By- Rahul sir

Topics to be Covered

Topic Sketching graphs → basic graphs

[Prob DPP]

Syllabus:

CSE + DA

DA ⟶

CS ⟶

- ✓ Sketching graphs
- ✓ Limit and continuity
- ✓ Differentiability of a function
- ✓ Taylor Series / MEAN value Theorem
- ✓ Optimization ← max/min in Single variables

20-25 Hrs.

max 5-7 marks

SAMPle Paper

Statistics

90-(35+)

↙

Preparation

DPP - Single Topic ✓

= 70-75 questions

Basic Integration

→ Prob | statistics

→ 12th + Advanced

✓ Aptitude - 10-15 marks + 45-50 marks

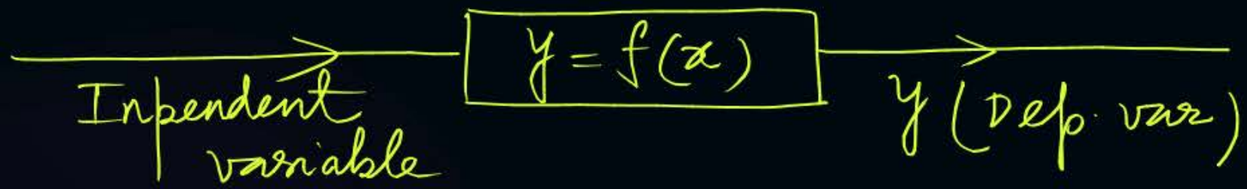
35 marks - Sample 85%

30-35 marks

- Prob - 10-15 marks
- Linear - 10-15 marks
- Calculus - 5-8 marks

Basic graphs:

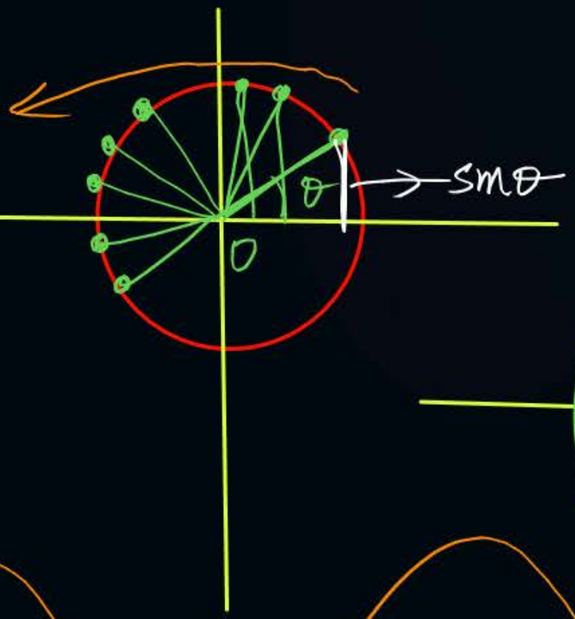
$y = f(x)$ x = Independent variable
y = Dependent variable



X = domain of Function
Y = Range of The function

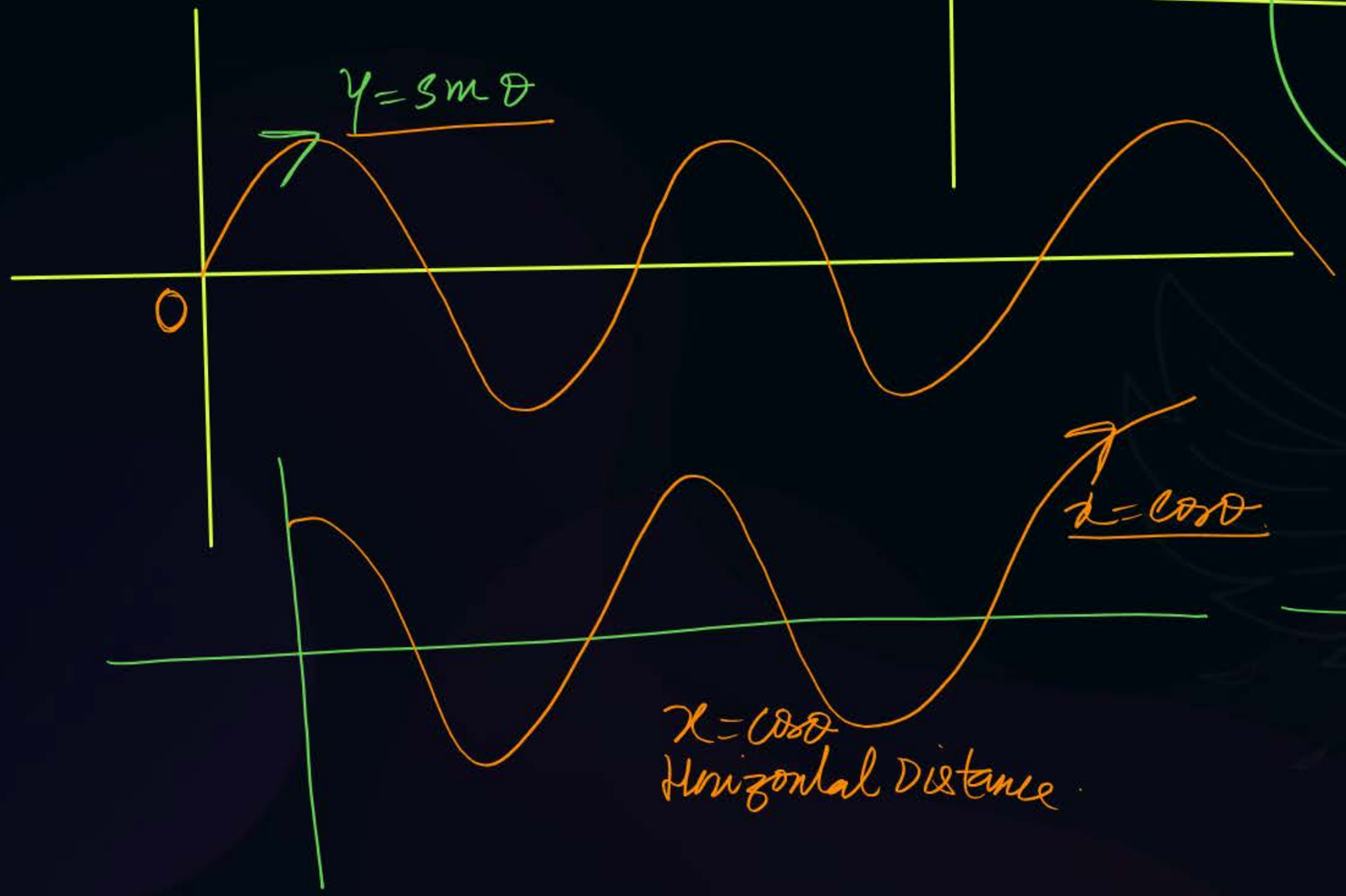
$f : \text{Weight} \longrightarrow \text{Indian Rupees}$

$f : X \longrightarrow Y$

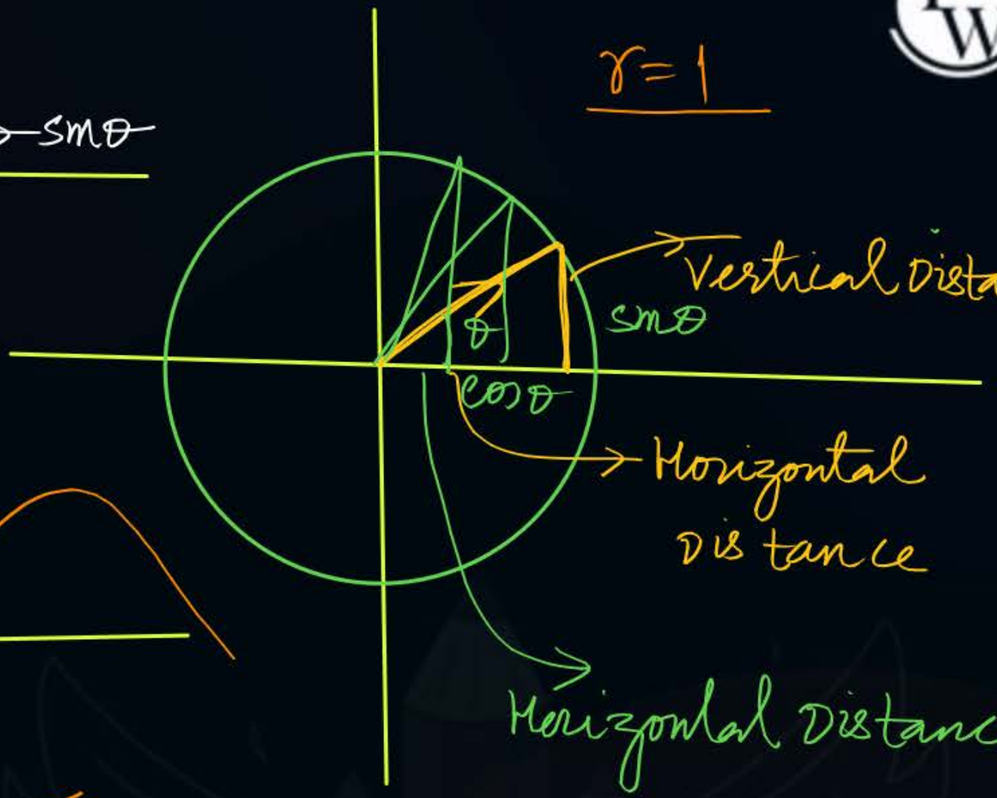


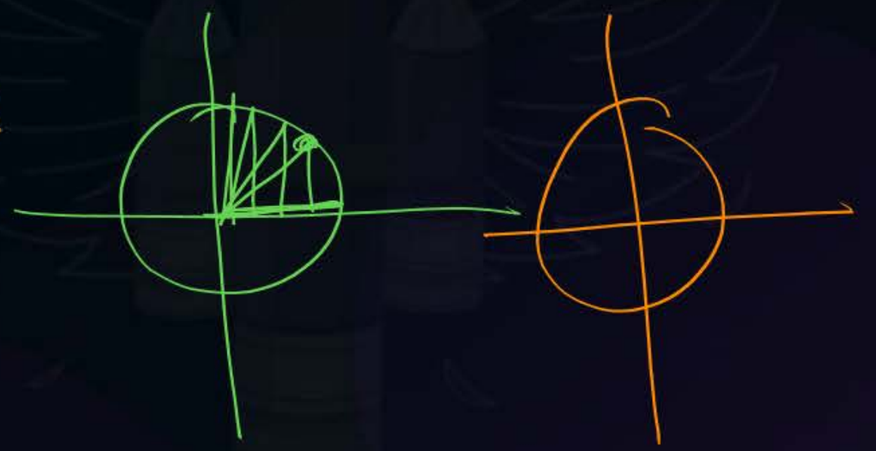
Vertical distance

Vertical Distance = $y = \sin\theta$



$r = 1$





Modulas Function:

Negative input — reject

$f(x) = y = |x|$

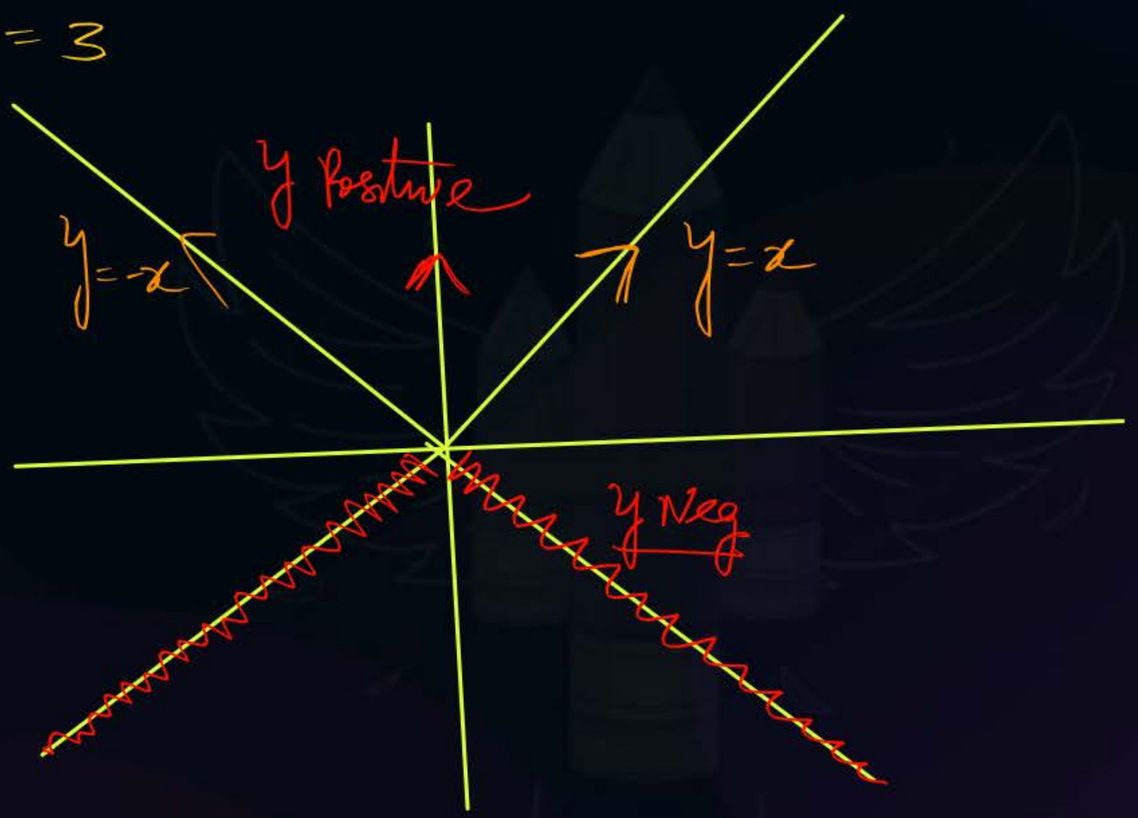
Put $x = 1 \quad y = |1| = 1$

$x = 2 \quad y = |2| = 2$

$x = -3 \quad y = |-3| = 3$

y always +

$$y = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$ Compound Function



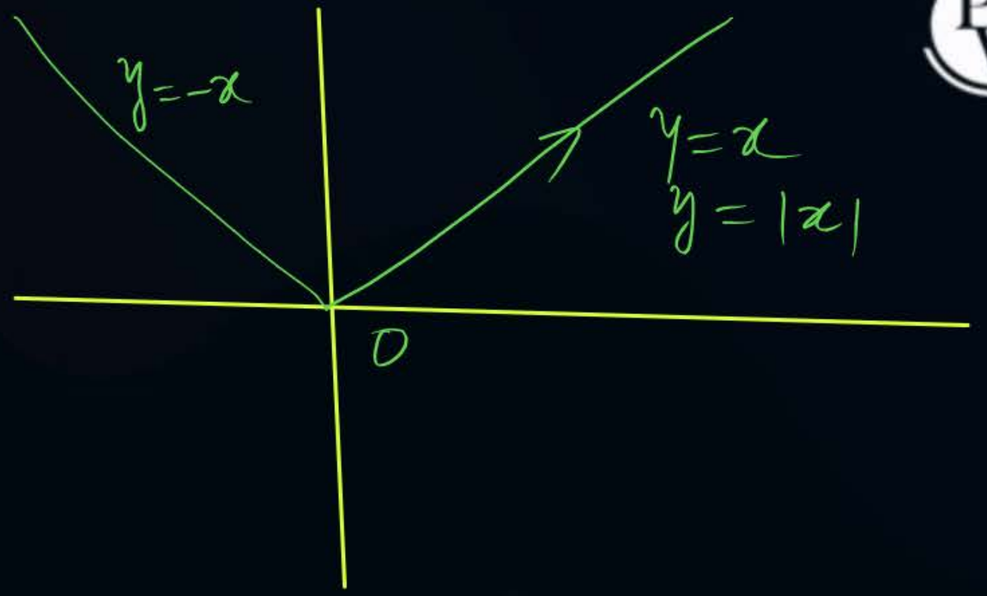
Sketch The graph

1) $y = |x+5|$

2) $y = |x-5|$

3) $y = |x|+5$

4) $y = |x|-5$



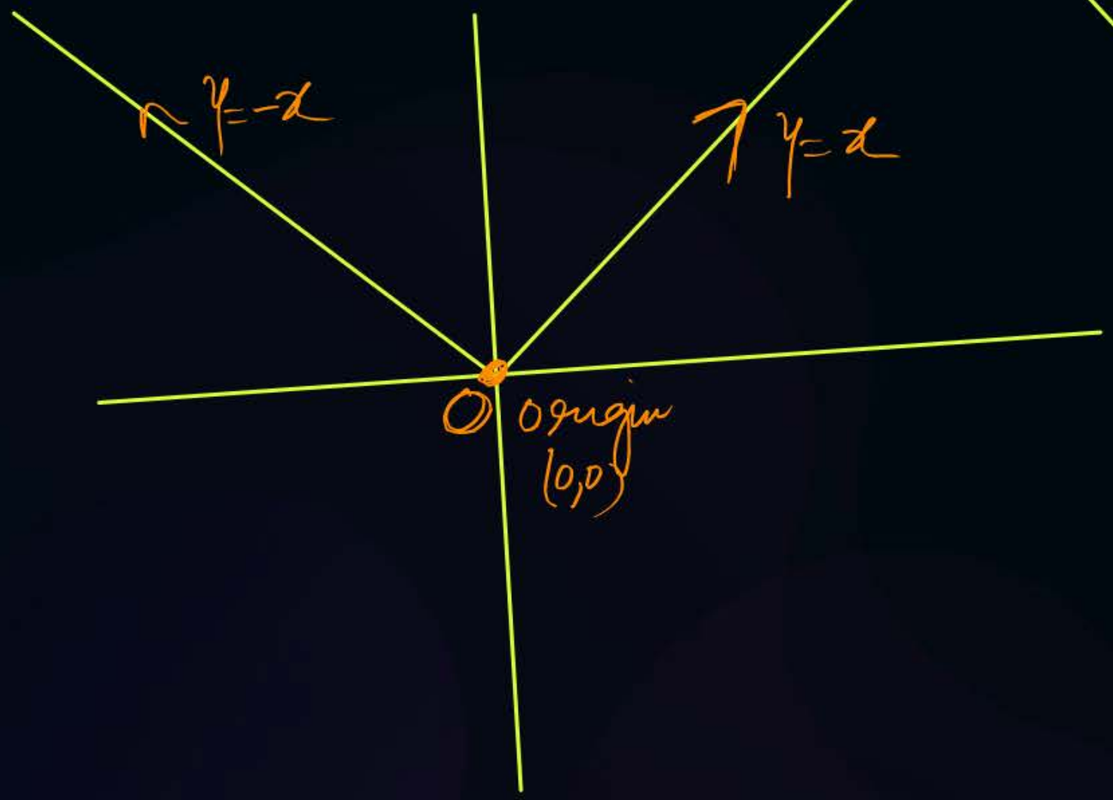
$y = |x+5|$

$= |x+5|$

$y = |x| = |x-0|$

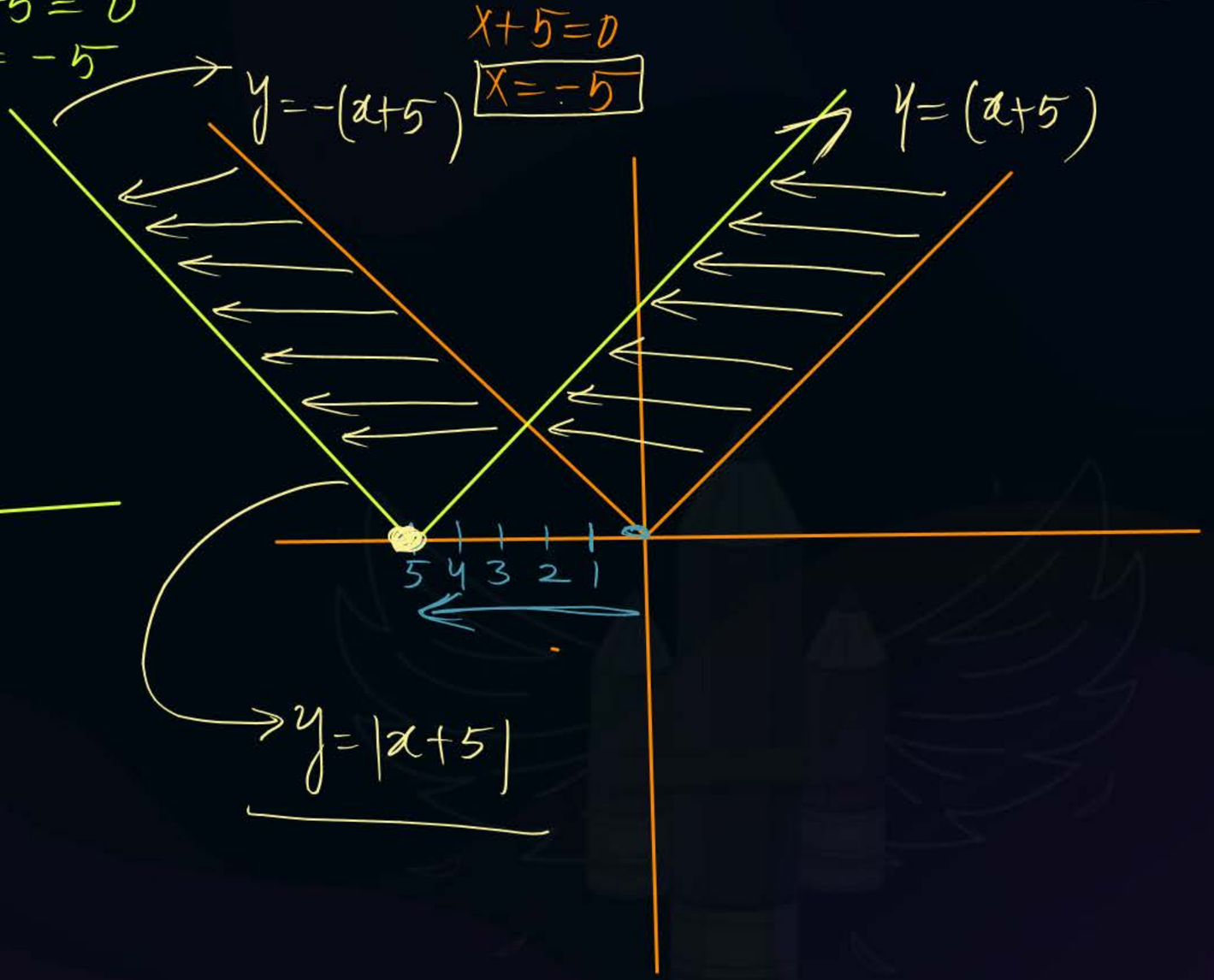
$x+5=0$

$x=-5$

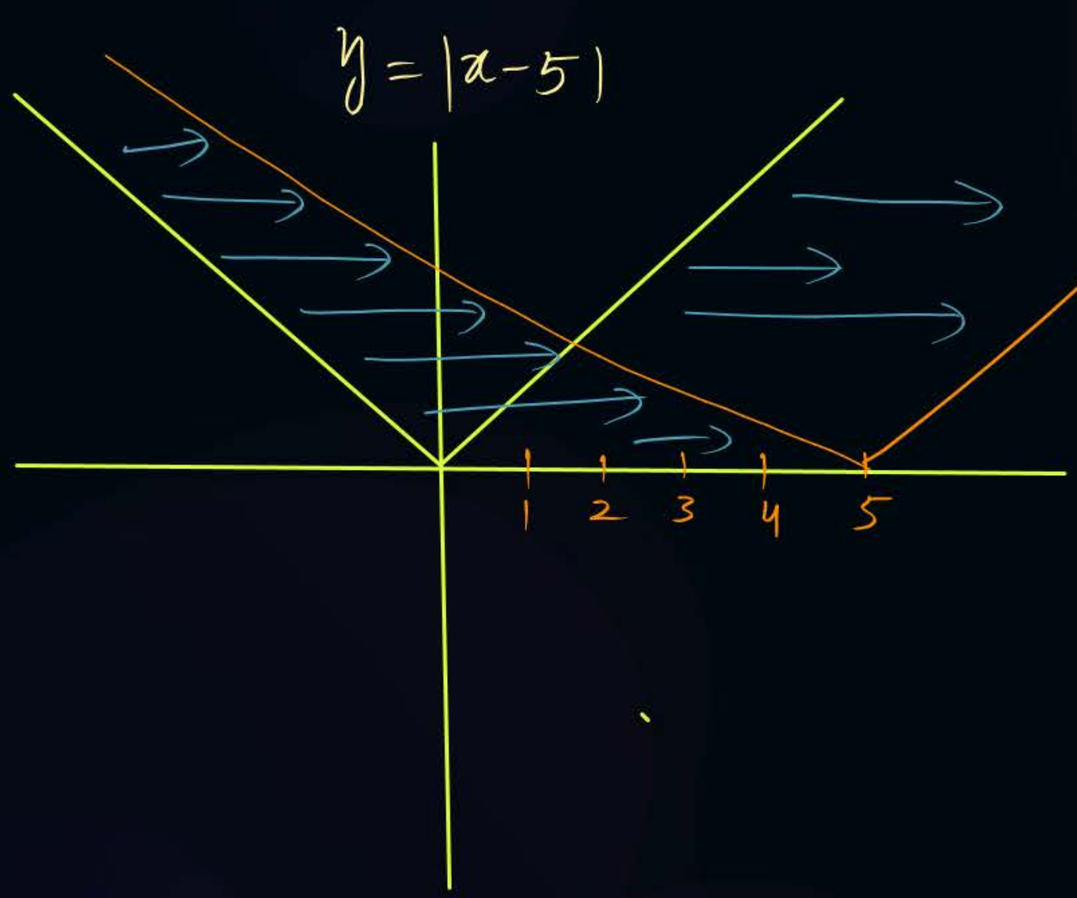


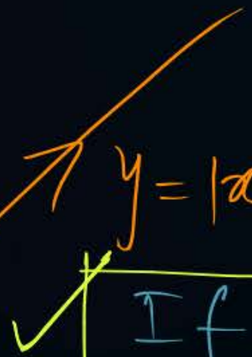
$x+5=0$

$x=-5$



$y = |x+5|$





max(x, y) – Prob.

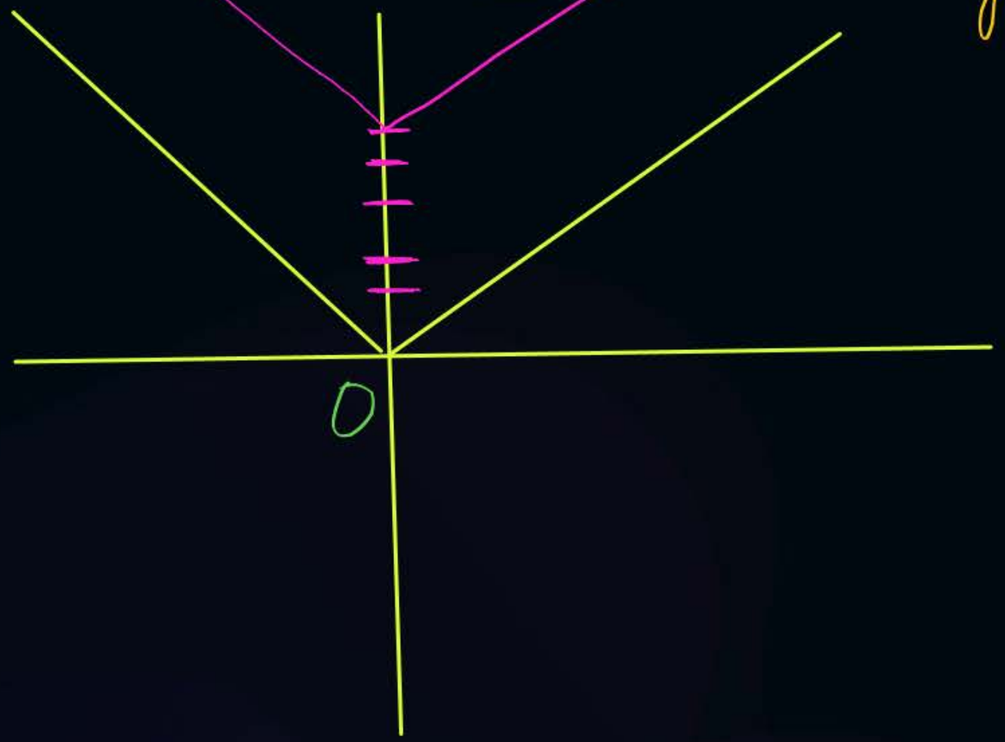
If $y = |x+a|$ → Internal Adjustment

shift a units Left ← a

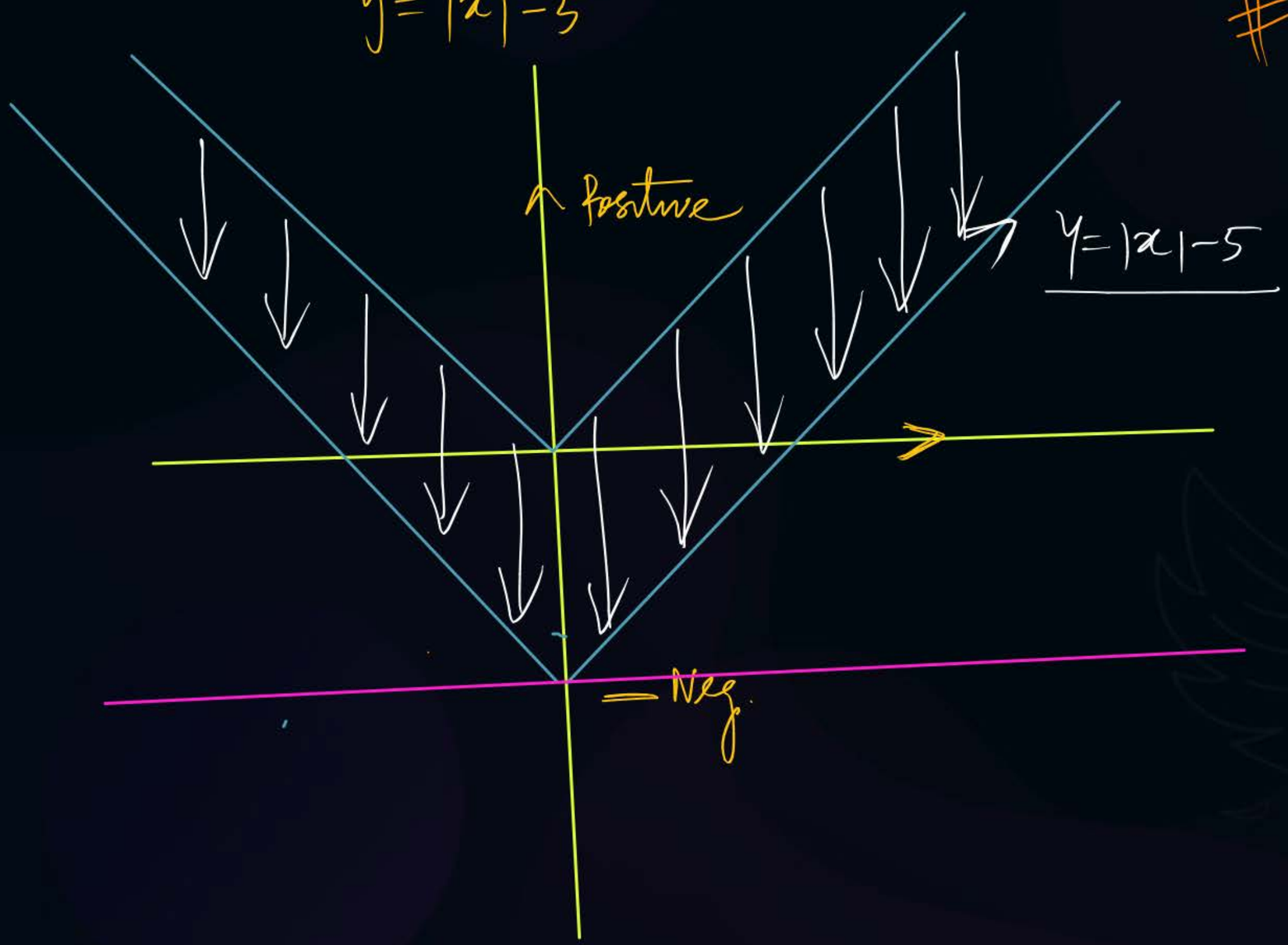
If $y = |x-a|$

shift a units right → a

$y = |x| + 5$ external change



$y = |x| - 5$



$y = |x| - 5$

#

* If $y = |x| + a$ shift a units ↑
* If $y = |x| - a$ "shift a units" ↓

$y = [x]$

greatest integer function

PIECES

$$\begin{cases} [0.1] = 0 \\ [0.9] = 0 \\ [0.8] = 0 \\ [1.1] = 1 \\ [1.9] = 1 \end{cases}$$

JEST

ISI, TIFR, CMI,

Tech Course

$y = [x]$ g.I.F greatest integer function

$y = \{x\}$ Fractional Part of x

$y = \{x\}$ = fractional Part of x

$$y = f(x) = \{x\} = x - [x]$$

$x - [x] = x - 0$ — Straight Line

$= x - 1$

$= x - 2$

$= x - 3$

$\vdots$

$= x - (n-1)$

simple

always

Integer defined

$0 \le x < 1$	$[x] = 0$
$1 \le x < 2$	$[x] = 1$
$2 \le x < 3$	$[x] = 2$
$3 \le x < 4$	$[x] = 3$

$n-1 \le x < n$

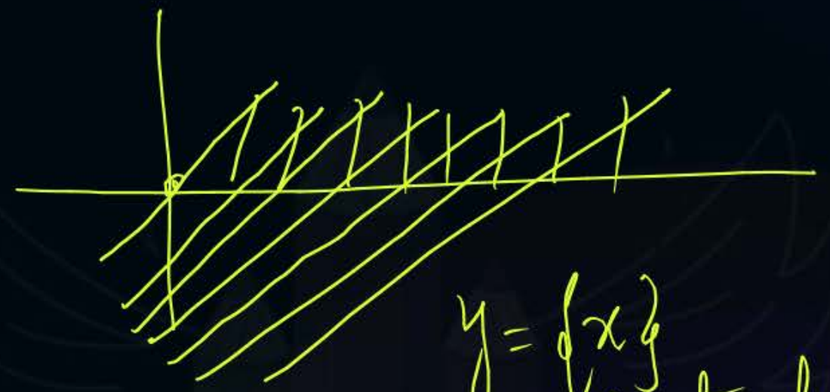
$$\{x\} = x - [x] = \begin{cases} x \\ x-1 \\ x-2 \\ x-3 \\ x-4 \\ \vdots \\ x-(n-1) \end{cases}$$

x = Integer + fractional

$x = [x] + \{x\}$

$\boxed{x = I + f}$

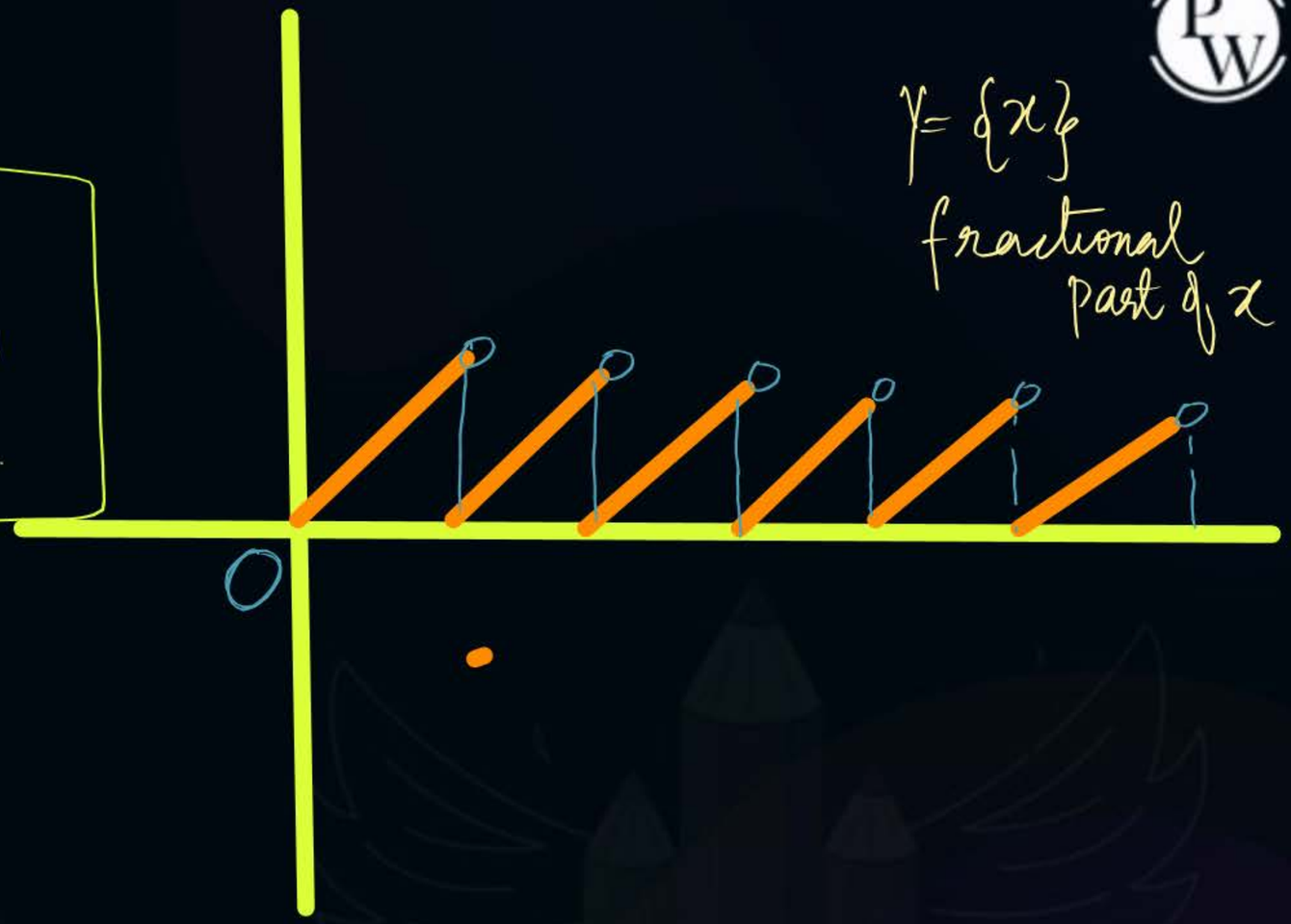
$f = \{x\} = x - [x]$



$y = \{x\}$ fractional part of x

Today - Homework

- ✓ Negative x-axis — $[x]$
- ✓ Negative x-axis — $\{x\}$



SUMMARY ✓

S
A) = Modulas function
B) = g.I.K
C) = fractional
D) = sm
E) = cos.

THANK - YOU