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RELATION & FUNCTION

← CLASS NO: 4 →

Modulus function

✓ Symbol. | |

✓ $|-2| = 2$; $|3| = 3$

✓ $f(x) = |x|$

✓ If $x = |-2|$
$\Rightarrow x = 2$

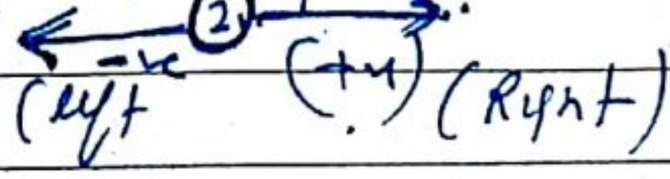
✓ If $|x| = 2$
then $x = \pm 2$

$|x| = 2$
$|2| = 2$
$|-2| = 2$

✓ $$f(x) = |x| = \begin{cases} x & ; x \geq 0 \\ -x & ; x < 0 \end{cases}$$

✓ $$|x-2| = \begin{cases} (x-2) & ; x-2 \geq 0 \ ; \ x \geq 2 \\ -(x-2) & ; x-2 < 0 \ ; \ x < 2 \end{cases}$$

✓ Critical point $f(x) = |x-2|$



✓ $f(x) = |x-2| =$ +ve

Domain = R

Range = $[0, \infty)$

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R & F Class No: 4 (2)

(*) $f(x) = -|x-2| = \boxed{-x}$

Domain = R.

Range = $(-\infty, 0]$

(.) $f(x) = 1 + |x+2|$

Dom = R

Range = $[1, \infty)$

(') $f(x) = 1 - |x-3|$

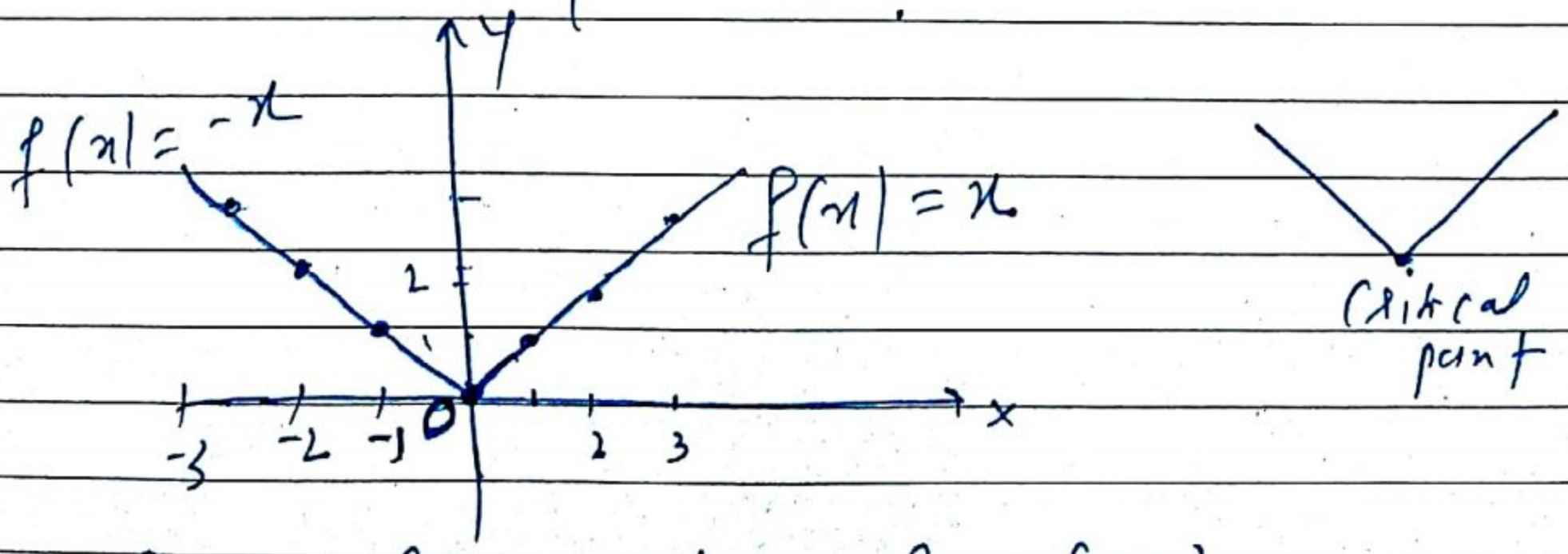
Range = $(-\infty, 1]$

(') $f(x) = |x-2| - 3$ $(-3, \infty)$

Range = $[-3, \infty)$

Graph

$$f(x) = |x| = \begin{cases} x & ; x \geq 0 \\ -x & , x < 0 \end{cases}$$



Dom = R and Range $[0, \infty)$

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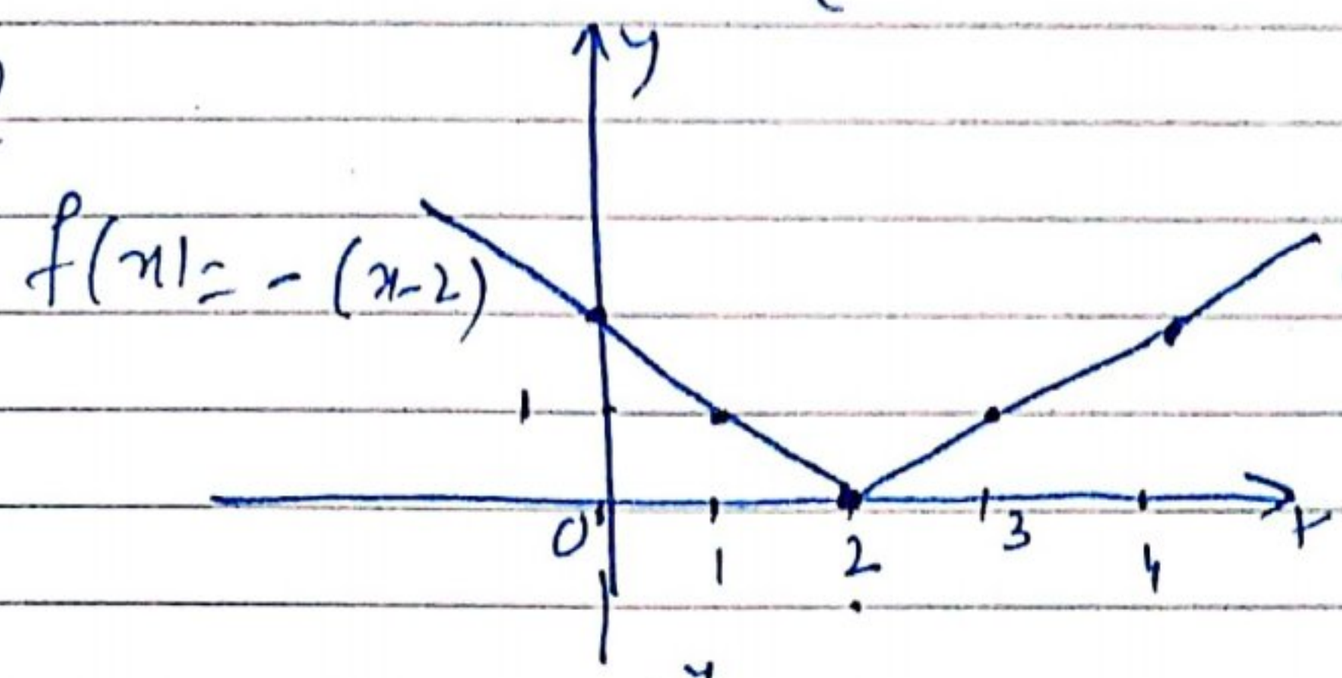
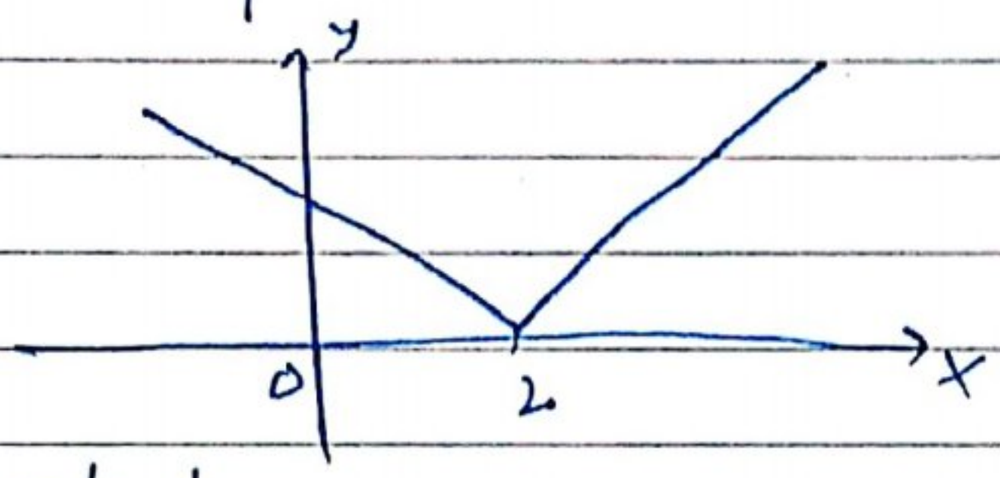
R & F Class No: 4 (3)

eg $f(x) = |x-2| = \begin{cases} x-2 & : x-2 \geq 0 \;;\; x \geq 2 \\ -(x-2) & : x-2 < 0 \;;\; x < 2 \end{cases}$

(2)

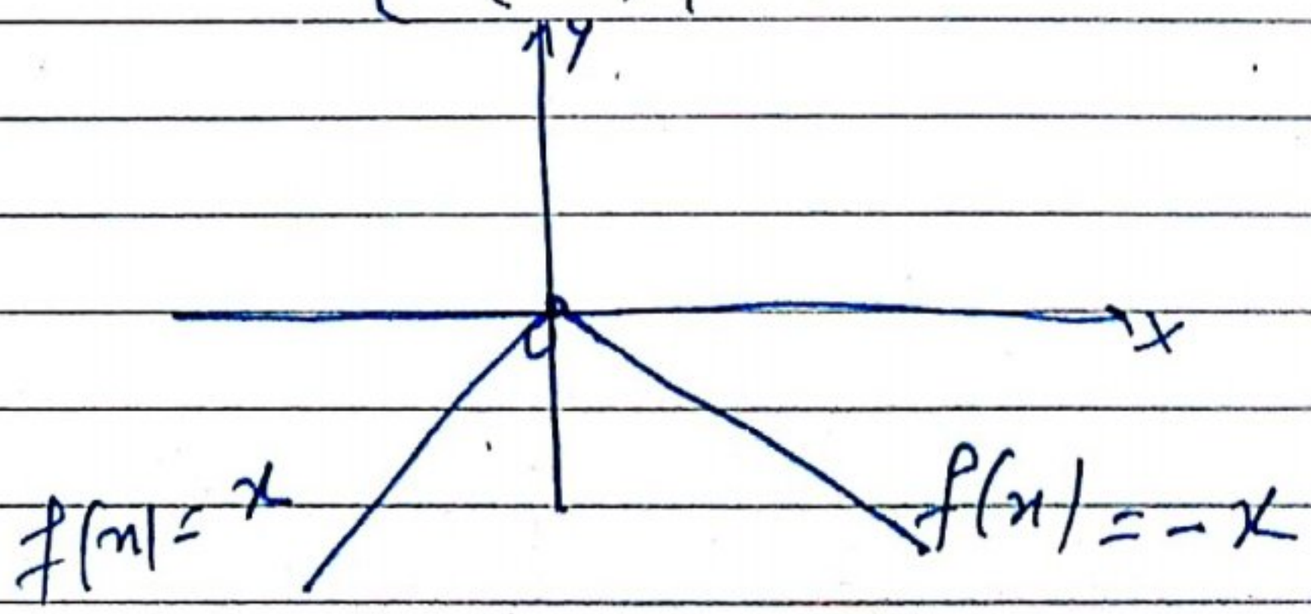
Graph





eg $f(x) = -|x|$

$f(x) = \begin{cases} -x & : x \geq 0 \\ -(-x) & : x < 0 \end{cases}$



eg $f(x) = 2 + |x-1|$

$f(x) = \begin{cases} 2 + (x-1) & : x-1 \geq 0 \\ 2 + -(x-1) & : x-1 < 0 \end{cases}$

$f(x) = \begin{cases} x+1 & : x \geq 1 \\ -x+3 & : x < 1 \end{cases}$

CLASSTIME

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R&F Class No: 4 (4)

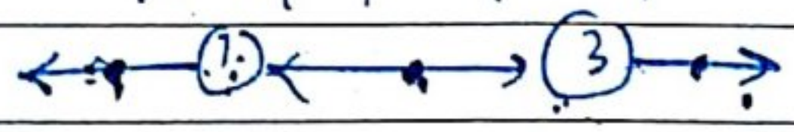
(IM) Redefine the function

$$f(x) = |x-3| + |x-1|$$

(3) (1)

Sol:

$$f(x) = |x-1| + |x-3|$$



$$f(x) = \begin{cases} -(x-1)-(x-3) & ; \quad x < 1 \\ (x-1)-(x-3) & ; \quad 1 \le x < 3 \\ (x-1)+(x-3) & ; \quad x \ge 3 \end{cases}$$

$$f(x) = \begin{cases} -2x+4 & ; \quad x < 1 \\ 2 & ; \quad 1 \le x < 3 \\ 2x-4 & ; \quad x \ge 3 \end{cases}$$

(IMP) $f(x) = |x+1| + |x-2|$; $-3 \le x \le 4$

$$f(x) = \begin{cases} -(x+1)-(x-2) & ; \quad -3 \le x < -1 \\ (x+1)-(x-2) & ; \quad -1 \le x < 2 \\ (x+1)+(x-2) & ; \quad 2 \le x \le 4 \end{cases}$$

$$f(x) = \begin{cases} -2x+1 & ; \quad -3 \le x < -1 \\ 3 & ; \quad -1 \le x < 2 \\ 2x-1 & ; \quad 2 \le x \le 4 \end{cases}$$

(2) Greatest Integer Function

✓ $f(x) = [x]$

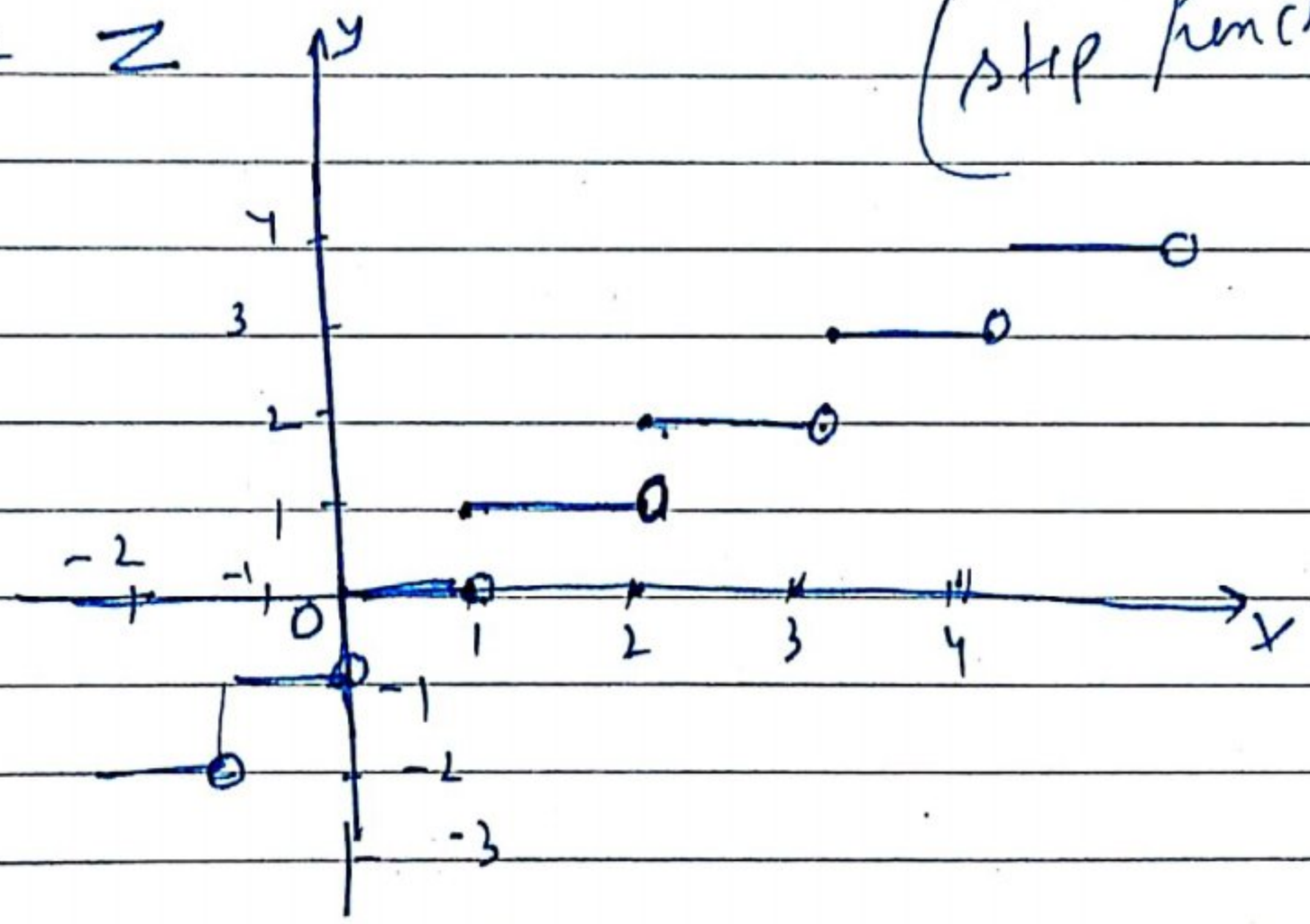
$[1.3] = 1$ ✓
$[\sqrt{7}] = 2$
$[2.9991] = 2$ ✓
$[3] = 3$.

$[0.5] = 0$
$[-1.5] = -2$
$[-3.999] = -4$
$[-4] = -4$

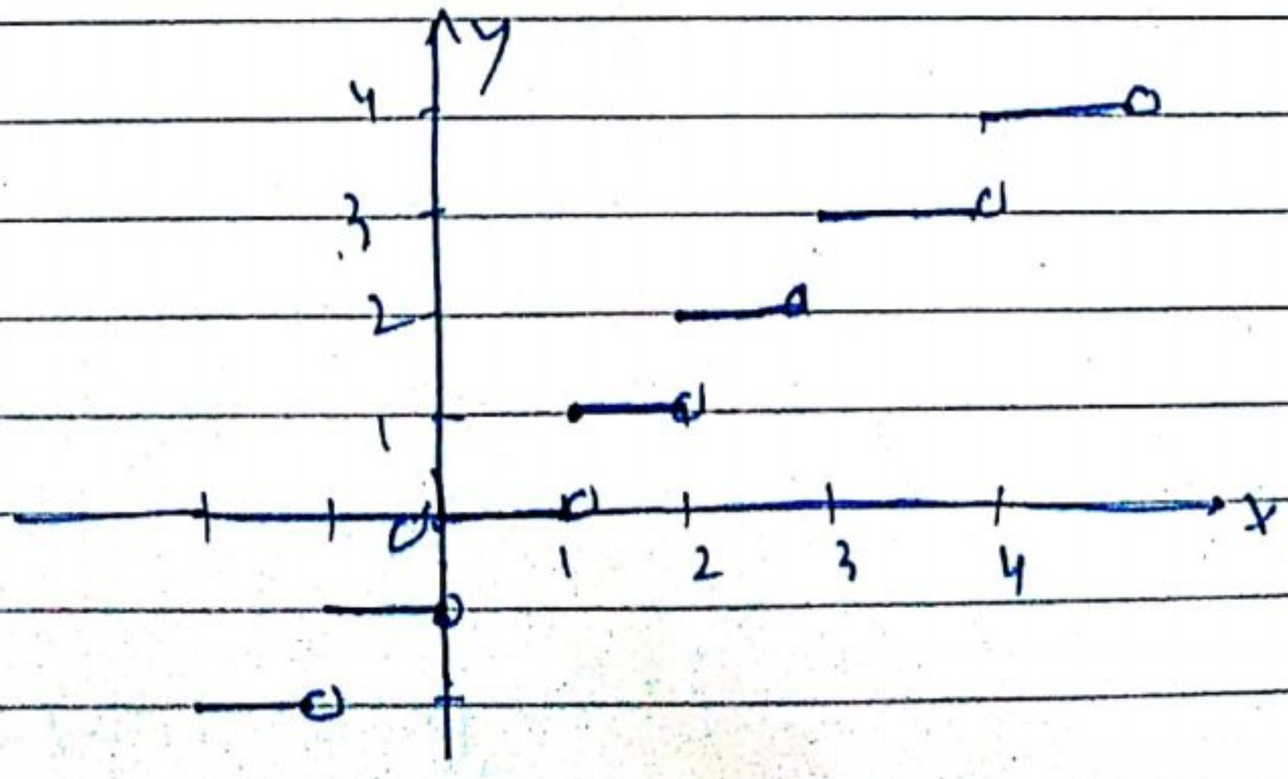
✓ Domain = R
✓ Range = Z

(step function)

Q. Q, 4



(8)



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(3) Signum function

$$f(x) = \begin{cases} 1 & ; x > 0 \\ -1 & ; x < 0 \\ 0 & ; x = 0 \end{cases}$$

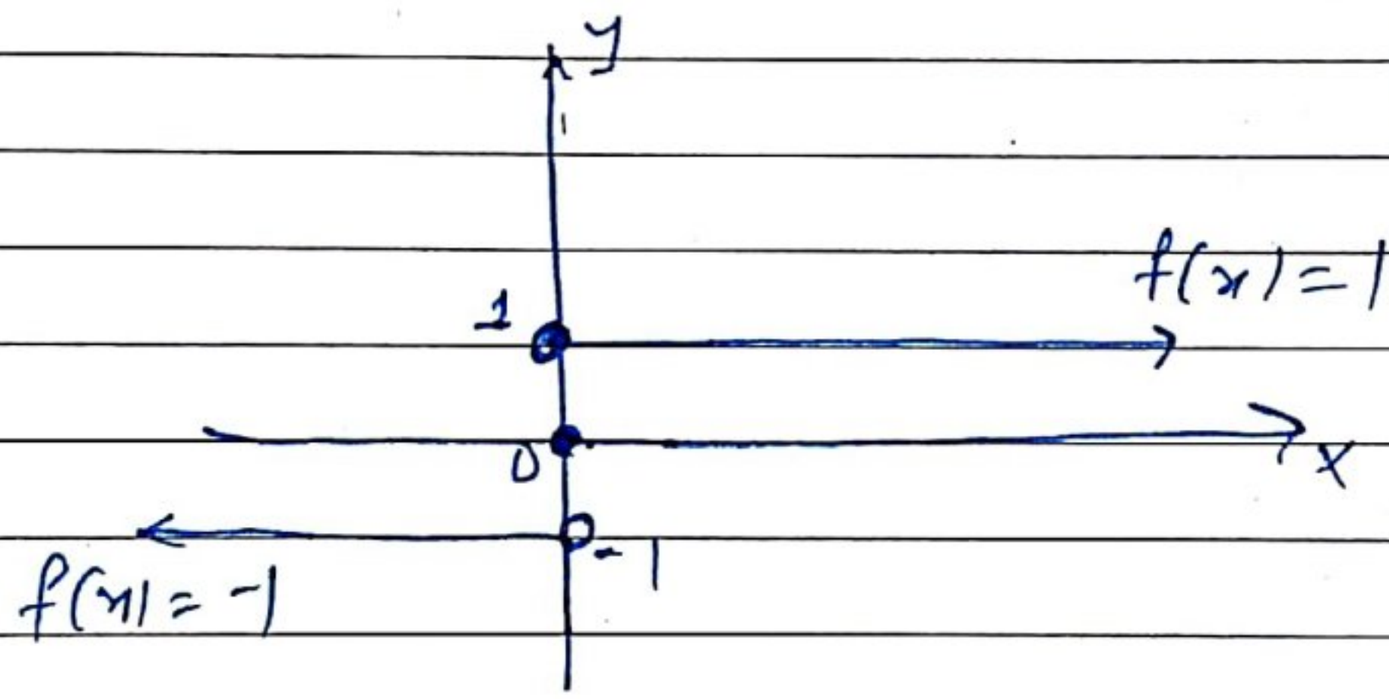
OR

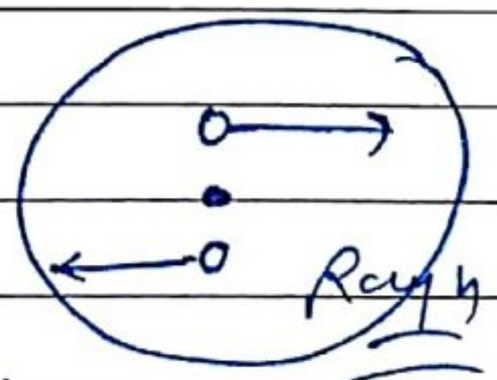
$$f(x) = \begin{cases} \frac{|x|}{x} & ; x \neq 0 \\ 0 & ; x = 0 \end{cases}$$

Domain = R

Range = {1, -1, 0}

Graph



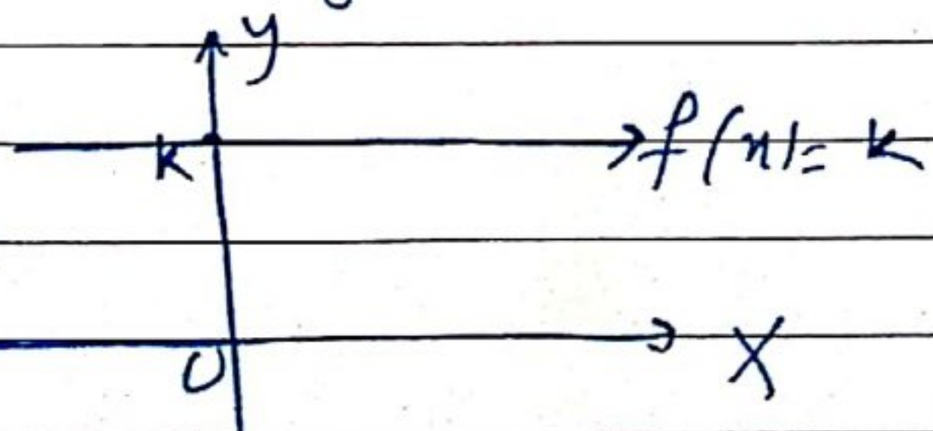


(4) Constant function

$f(x) = k$ (constant) eg $f(x) = 3$

Domain = R ; Range = {k}

Graph



(5) Identity function

$f(x) = x$

Domain = R

Range = R