MCA CET 2025

MATHS

Set Relation and
Function

Real Number System & Inequalities

$N \longrightarrow$ Natural Number

$W \longrightarrow$ Whole Number

$Z/I \longrightarrow$ Integers

$Q \longrightarrow$ Rational Number

$R \longrightarrow$ Real Number

$[-\infty, +\infty] \longrightarrow$

N^+

$I^+ \mid I^-$

$0, 1, 2, \ldots$

$-1, -2, \ldots$

$R^+ \longrightarrow [0, \infty)$

$R^- \longrightarrow (-\infty, 0)$

Rational Number

$a/b \rightarrow a, b \in I$

$b \neq 0$

$H.C.F(a, b) = 1$

$6 \Rightarrow \frac{6}{1}$

$0.3333 \text{---} \Rightarrow \frac{1}{3}$

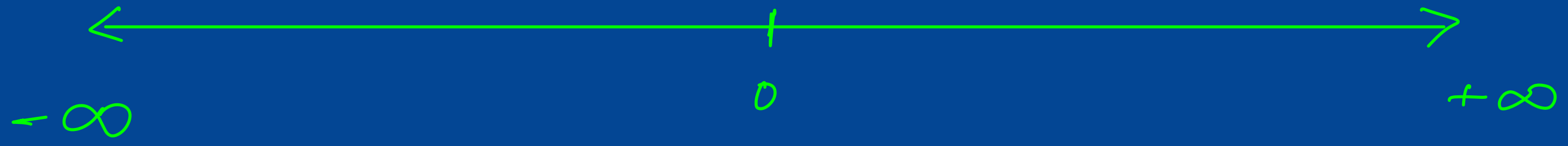
$0.716716716716 \text{----} \Rightarrow \frac{716}{999}$

6.0 $0.333\ldots$

Irrational Number

- neither terminating
- nor recurring

eg:- $\sqrt{2}$, π, $2+\sqrt{2}$, ...


$-\infty$
0
$+\infty$

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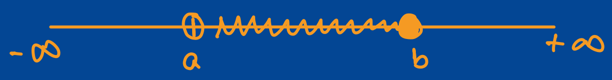
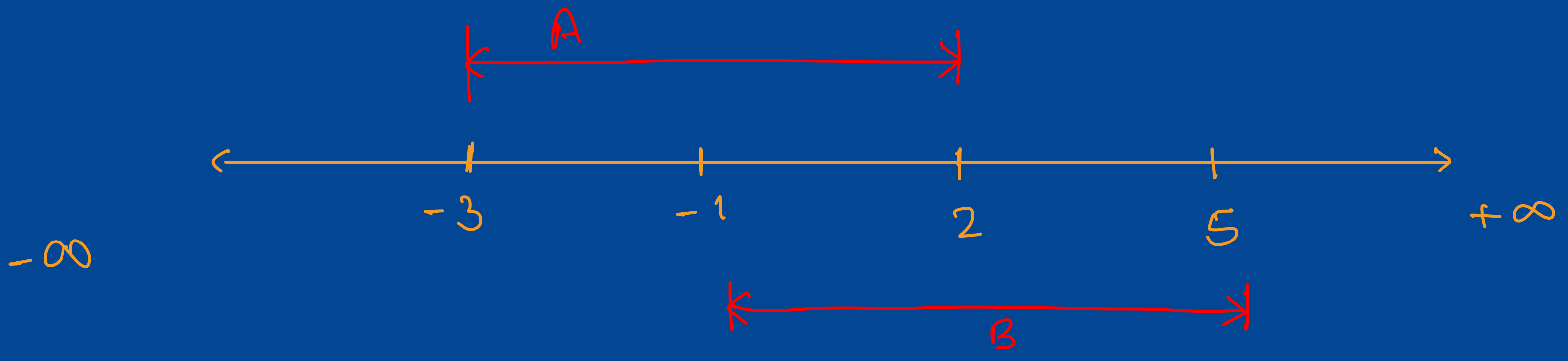
Interval	Interval Name	Plotting on real number Line
$\{x \mid a < x < b\}$ or $x \in (a,b)$ or $x \in]a, b[$	open interval	
$\{x \mid a \leq x \leq b\}$ or $x \in [a,b]$	closed interval	
$\{x \mid a \leq x < b\}$ or $x \in [a, b)$ or $x \in [a, b[$	Closed-open interval	
$\{x \mid a < x \leq b\}$ or $x \in (a, b]$ or $x \in]a, b]$	open-closed interval	

eg :- if $A = (-3, 2]$ and $B = (-1, 5]$ then

1. $A \cap B \longrightarrow (-1, 2]$

2. $A \cup B \longrightarrow (-3, 5]$



Inequalities

a) if $a \le b \longrightarrow$ either $a < b$ or $a = b$

b) if $a < b$ and $c < d \Longrightarrow a + c < b + d$

eg:- $1 < 2$, $4 < 6 \Rightarrow 1+4 < 2+6$

$5 < 8$

$k = -2$

$2 < 3$

$(-2)(2) > (-2)\cdot 3$

$\boxed{-4 > -6}$

c) if $a < b$ then $ka < kb \longrightarrow k > 0$

$ka > kb \longrightarrow k < 0$

$2 < 3$

$k = 2 \longrightarrow 2\cdot 2 < 2\cdot 3 \Rightarrow 4 < 6$

Value of x^2 from given x

$a < b \longrightarrow \boxed{a^2 < b^2} \longrightarrow$ not always

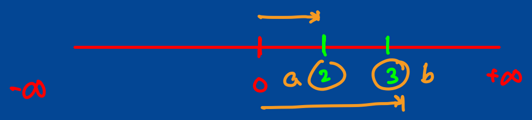
$2 < 3 \longrightarrow 2^2 < 3^2$

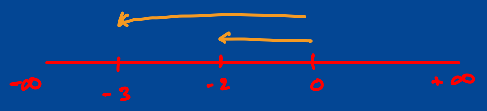
$4 < 9$

$(-2) > (-3) \longrightarrow (-2)^2 > (-3)^2$

$\boxed{4 > 9}$ ✗

$\rightarrow a < b \Rightarrow a^2 < b^2$ follows only when distance of 'a' from '0' on real number lines is less than distance of 'b' from '0'.





$a < b$

① ↳ $x^2 \le a^2 \longrightarrow x \in [-a, +a]$

eg:- $x^2 \le 9$

× <0

$\boxed{0, \quad 9}$

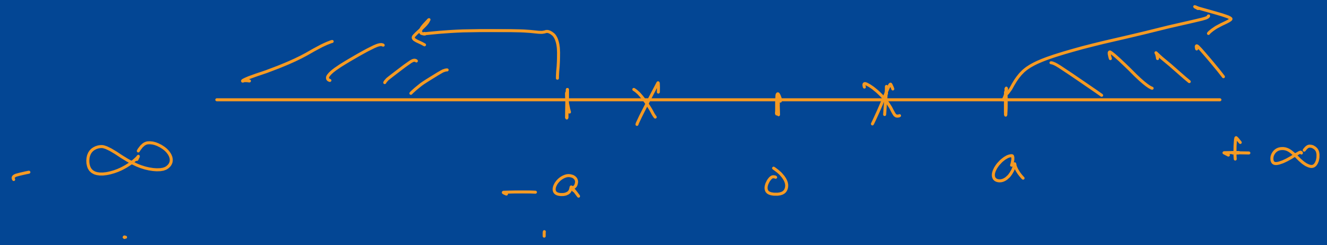
0, 1, 2, 3, 4, 5, 6, 7, 8, 9

$(2)^2$ $(-2)^2$ 3^2 $(-3)^2$ ✓

-3 0 3

11

$x^2 > a^2 \Rightarrow \underline{x \in (-\infty, -a) \cup (a, \infty)}$



→ value of $\frac{1}{x}$ from given x

$+2 < +3$ then $\frac{1}{2} > \frac{1}{3}$

$-6 < -4$ then $-\frac{1}{6} > -\frac{1}{4}$

$-3 < +2$ then $-\frac{1}{3} < \frac{1}{2}$

→ If values on both sides of inequality have same sign, while taking it's reciprocal the sign of inequality alters

→ opposite sign → sign same

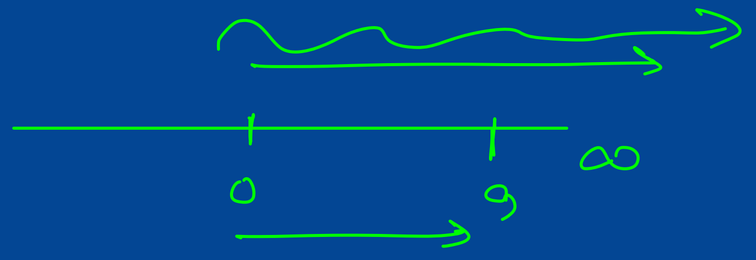
Q. Find the value of x^2 for the given values of x

1) $x < 3 \longrightarrow x^2$ — ?

$$(-\infty, 0) \cup [0, 3)$$

$$\downarrow x^2 \qquad\qquad \downarrow x^2$$

$$(0, \infty) \cup [0, 9)$$



$$x^2 \in [0, \infty)$$

H.W

i) $x > -1$

ii) $x \geq 2$

iii) $x < -1$

H.W

Q: find the values of $\frac{1}{x}$ for the given values of x.

(i) $x > 3 \longrightarrow \frac{1}{x}$?

$3 < x < \infty$

$\frac{1}{3} > \frac{1}{x} > \frac{1}{\infty}$

$\boxed{\frac{1}{3} > \frac{1}{x} > 0}$

(ii) $x < -2 \longrightarrow \frac{1}{x}$?

$-\infty < x < -2$

$\frac{1}{-\infty} > \frac{1}{x} > \frac{1}{-2}$

$\boxed{0 > \frac{1}{x} > -\frac{1}{2}}$

(iii) $x \in (-1, 3) - \{0\}$

$\frac{1}{x}$?

0 ✗

$(-1, 0) \cup (0, 3)$

$-1 < x < 0^-$

$\frac{1}{-1} > \frac{1}{x} > \frac{1}{0^-}$

$\boxed{-1 > \frac{1}{x} > -\infty}$

$0^+ < x < 3$

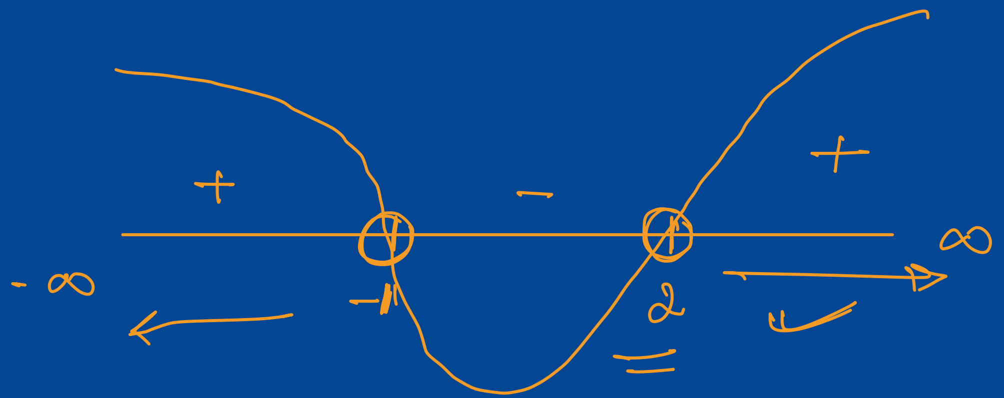
$\frac{1}{0^+} > \frac{1}{x} > \frac{1}{3}$

$\boxed{+\infty > \frac{1}{x} > \frac{1}{3}}$

$\boxed{\frac{1}{x} \in (-\infty, -1) \cup \left(\frac{1}{3}, \infty\right)}$ Ans

Qus Solve for x ?

$$x^2 - x - 2 > 0$$



Sol^n

$$x^2 + x - 2x - 2 > 0$$

$$x(x+1) - 2(x+1) > 0$$

$$(x+1)(x-2) > 0$$

$x + 1 = 0$

$x = -1$

$x - 2 = 0$

$x = 2$

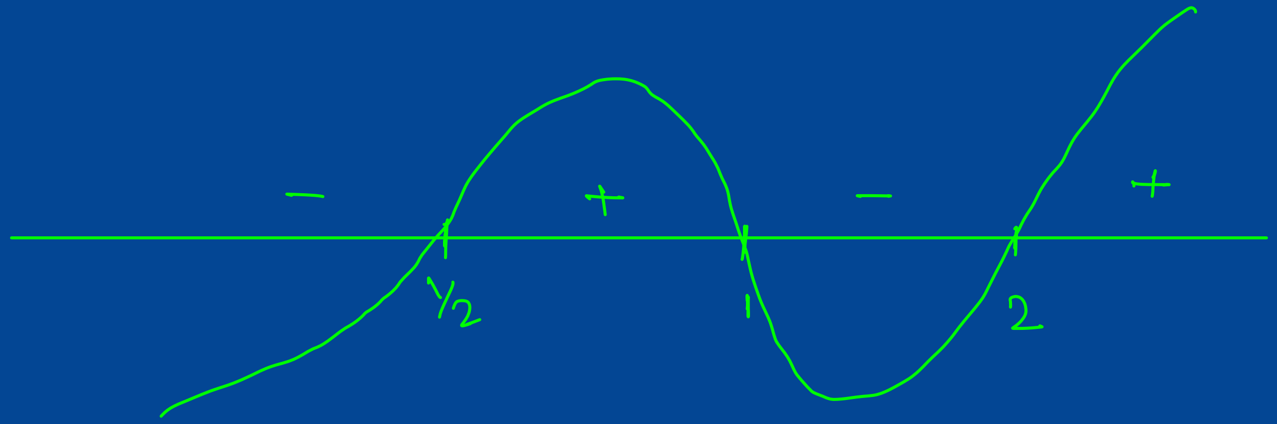
$$x \in (-\infty, -1) \cup (2, \infty)$$ Ans.

Ques $(x-1)^1(x-2)^1(1-2x)^1 > 0$; Solve for x ?

$$\left[-(x-1)(x-2)(2x-1)\right] > [0]$$

$$(x-1)(x-2)(2x-1) < 0$$

$x = 1$ $\quad$ $x = 2$ $\quad$ $x = \frac{1}{2}$



$$x \in \left(-\infty, \tfrac{1}{2}\right) \cup (1, 2)$$

H.W

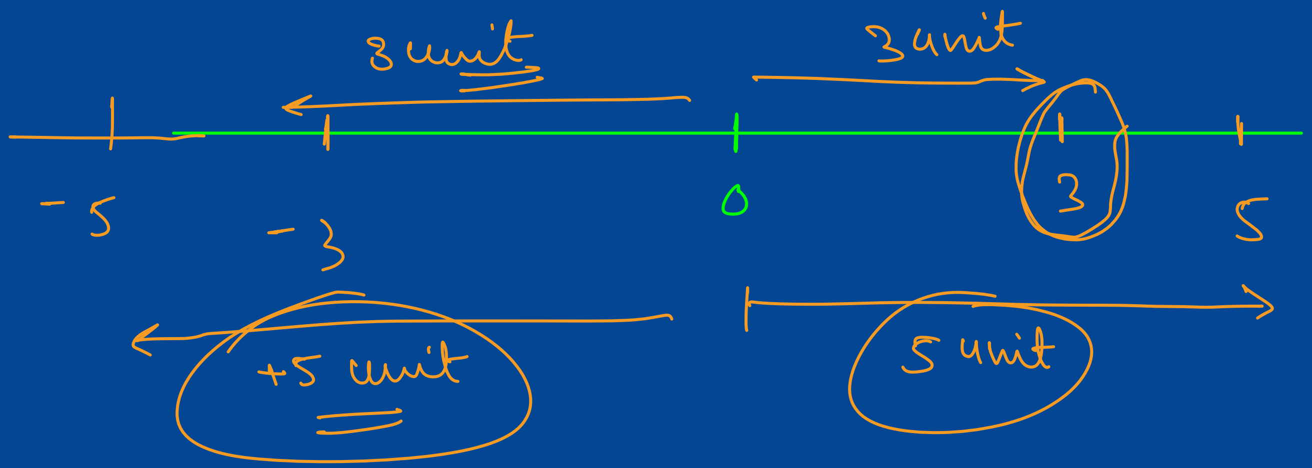
(i) $\frac{2}{x} < 3$

(ii) $\frac{x-2}{x+2} > \frac{2x-3}{4x-1}$

H.W

Modulus of Real Number

3   −3



↳ Distance of any real number from zero is called absolute value or modulus of that real number.

$|x|$

$$|x| \begin{cases} x & \text{if } x > 0 \\ -x & \text{if } x < 0 \end{cases}$$

$\therefore$ $|x| \rightarrow$ distance of x from 0.

Modulus of any Expression

$$|x-a| = \begin{cases} (x-a) & \text{if } x-a>0 \text{ or } x>a \\ -(x-a) \\ \downarrow \\ (a-x) & \text{if } x-a<0 \text{ or } x<a \end{cases}$$

Ques $\dfrac{|x+3|+x}{x+2} > 1$; solve for x.

Sol^n

$$\frac{|x+3|+x}{x+2} - 1 > 0$$

$$\frac{|x+3|+x-(x+2)}{x+2} > 0$$

$$\frac{|x+3|+\cancel{x}-\cancel{x}-2}{(x+2)} > 0$$

$$\frac{|x+3|-2}{x+2} > 0$$

$x+2=0$

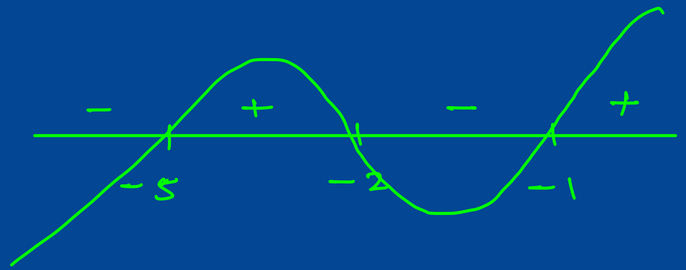
$x=-2$

$|x+3|-2=0$

$|x+3|=2$

$x+3=2 \quad\quad x+3=-2$

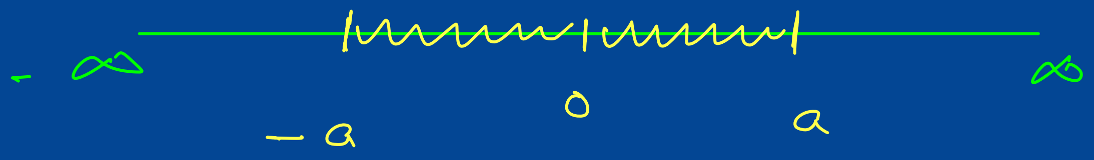
$x=-1 \quad\quad x=-5$



$$\boxed{x \in (-5,-2) \cup (-1,\infty)}$$ **Ans**

Inequalities involving Modulus

(i) $|x| \leq a$ $\{$ where $a > 0 \}$



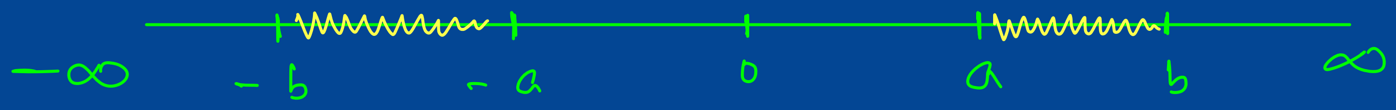
$x \in [-a, a]$

(ii) $|x| \geq a$ $\{$ where $a > 0 \}$

$x \in (-\infty, -a] \cup [a, \infty)$

(iii) $a \leq |x| \leq b$

$x \in [-b, -a] \cup [a, b]$



H.W

1) solve for x

$$\frac{x\,(3-4x)(x+1)}{(2x-5)} < 0$$

(ii)

$$\frac{5x+1}{(x+1)^2} < 1$$

(iii) $1 \leq |x-2| \leq 3$

H.W

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