



# RAFTAAR JEE

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Lecture number 1

Topic name: **BASIC MATHS**



**MSM SIR**

**MSM SIR**



**MATHEMATICS**

**SIDDHARTHA**

**MISRA**

## **TODAY'S GOAL**



- 1. Kuch - Baatein**
- 2. Wavy Curve Method**



**WELCOME TO THE WORLD OF JEE**



# JAROORI REPRESENTATIONS



' $\in$ ' belongs to  
' $\forall$ ' for all

$$\left\{ \begin{array}{l} x \in \{2, 3\} \\ x = 2, 3 \end{array} \right.$$



$$\left\{ \begin{array}{l} x \in (2, 3) \\ x \rightarrow '2' \text{ से '3'} \\ (x \neq 2, 3) \end{array} \right. \text{ (open Brackets)}$$



$\infty$  many values.

closed Bracket

$$x \in [2, 3]$$

$$\begin{cases} x = 2, 3 \\ \text{'2' से '3'}$$



# JAROORI BAAATEIN



" $\cup$ "  $\leftarrow$  Union  $\rightarrow$  "OR", "या ती"

" $\cap$ "  $\leftarrow$  Intersection  $\rightarrow$  "AND", "जी"  
(common values)

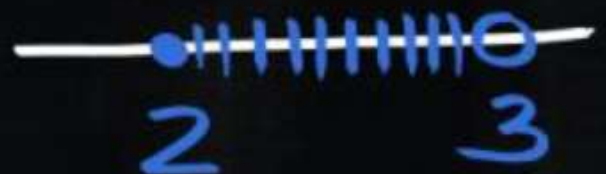
Q  $\rightarrow$   $x=2, y \in \{2,3\}$  . Find

(i)  $x \cup y \rightarrow \in \{2,3\}$  Ans


(ii)  $x \cap y \rightarrow \in \{2\}$  Ans



$\rightarrow \left\{ \begin{array}{l} x \in [2, 3) \\ x = 2, x \neq 3 \end{array} \right\} \quad 3 > x \geq 2$

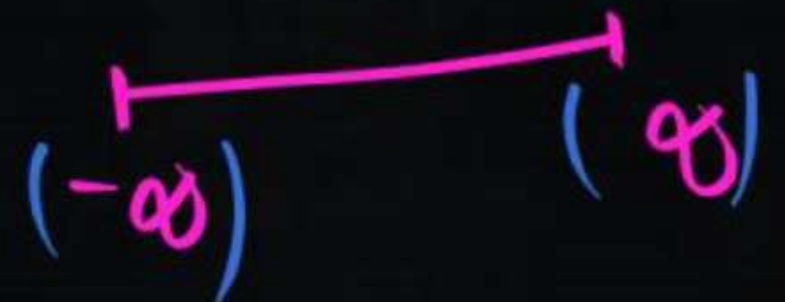


$\rightarrow \left\{ \begin{array}{l} x \in (2, 3] \\ x \neq 2, x = 3 \end{array} \right\} \quad 3 \geq x > 2$



$\infty \downarrow$   
 सबसे  
 Bada  
 Number

$(-\infty) \downarrow$   
 सबसे  
 Chota  
 Number





# Wavy Curve Method

→ Inequalities & Qs



Rule →

(1) make sure RHS is zero.

(2) factorize into linear factors

linear factor  
tut Jaega  
(factorize ho  
Jaega)

(factorize  
naa  
ho.)

(3) In each factor (linear), coefficient of 'x' must be positive.



'x' की  
coefficient

(4) अगर nahi hua, toh positive Banaenge



(5) Baba Ki tarange .....

Basic Mathematical Rules →

$$\Rightarrow \begin{array}{l} \boxed{2 < 3} \\ x(-1) \rightarrow \underline{(-2)} > \underline{(-3)} \end{array}$$

} Rule Number 1 →  
" minus se multiply  
Karnaega, toh  
sign bhi palat  
Jaega "

Rule No. 2 →

$$(-a)(-b)(-c) = -abc$$



$$\begin{array}{l} x(-1) \left\{ \begin{array}{l} a \cdot b \cdot c \\ a(-b)(c) \\ \text{OR} \\ (-a)(b)(c) \\ \text{OR} \\ (a)(b)(-c) \end{array} \right\} \Rightarrow (-abc) \end{array}$$

$$\begin{array}{l} \Rightarrow a b c d \\ a(-b)(c)(d) \quad x(-1) \Rightarrow (-a)(-b)(-c)(-d) \\ = (-abcd) \quad \quad \quad = (abcd) \end{array}$$



# POLYNOMIAL INEQUALITIES

Q → Solve for 'x' →

✓ (i)  $(x-1)(x-2) > 0$

✓ (ii)  $(x-1)(x-3) \leq 0$

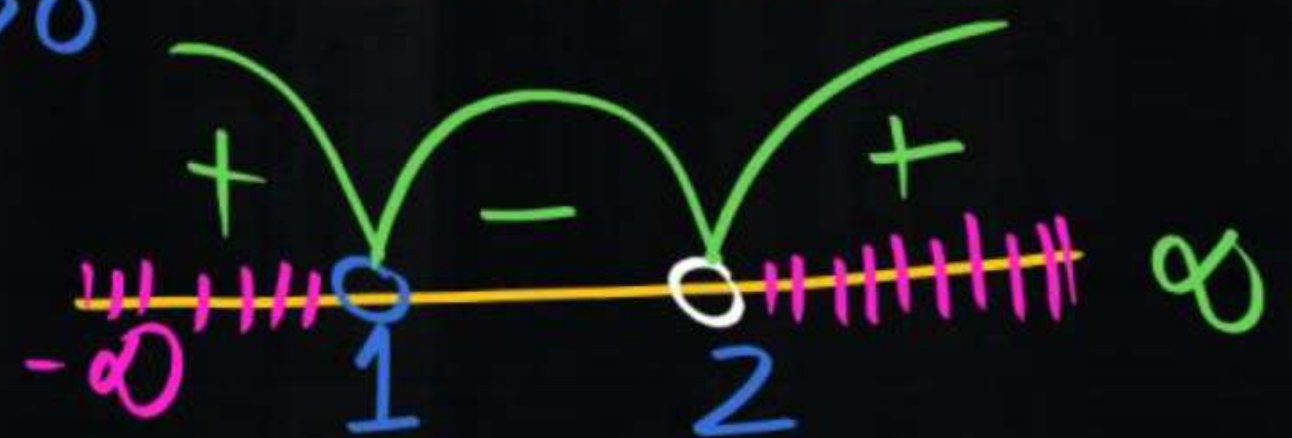
Solution →

(i) 'x' ki wo value find karo, jiske liye  $(x-1)(x-2)$  greater than zero.

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

$0 > 0$   
 (Invalid)

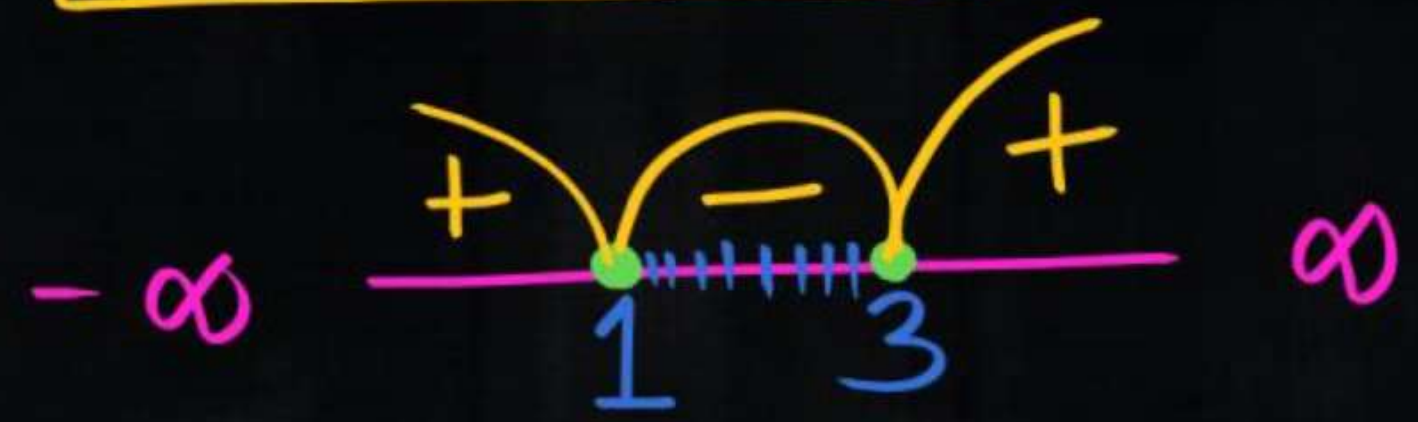
$x=2$   
 $0 > 0$   
 (Invalid)



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

(ii)  $(x-1)(x-3) \leq 0$

$x=3$   
 $0 \leq 0$



$x \in [1, 3]$   
Ans

$x=1 \rightarrow$   
 $0 \leq 0$   
(Valid)  
 $0 < 0$  2A  
 $0=0$  ✓

Gyaan  
( $\pm \infty$ ) के  
साथ  
Hamesha  
open -  
Bracket  
hoga



?

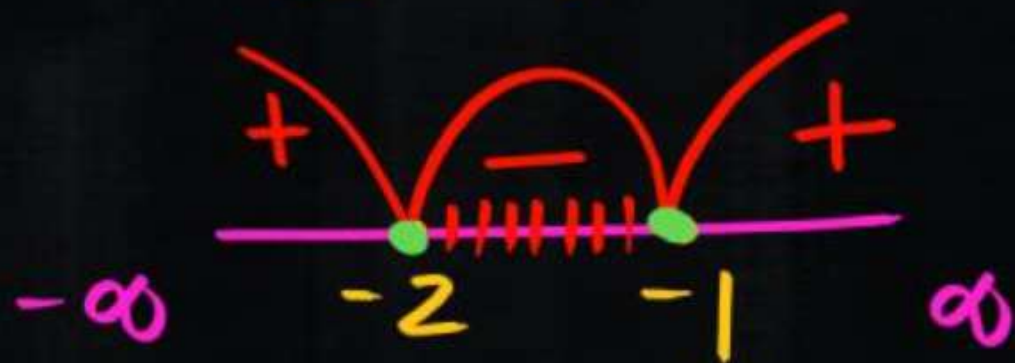
Solve for x-

$$x^2 + 3x + 2 \leq 0$$

$$x = -1 \Rightarrow \underline{0 \leq 0} \text{ (valid)}$$

$$x = -2 \Rightarrow \underline{0 \leq 0} \text{ (valid)}$$

$$(x+1)(x+2) \leq 0$$



Ans

$$x \in [-2, -1]$$



?



Solve for x-

$$x^2 + x - 1 \leq 0$$

$$x - \left(-\frac{1-\sqrt{5}}{2}\right) = 0$$

$$\rightarrow x = -\frac{1-\sqrt{5}}{2}$$

Shri Dhanacharya  
Baba(Quadratic  
Formula)

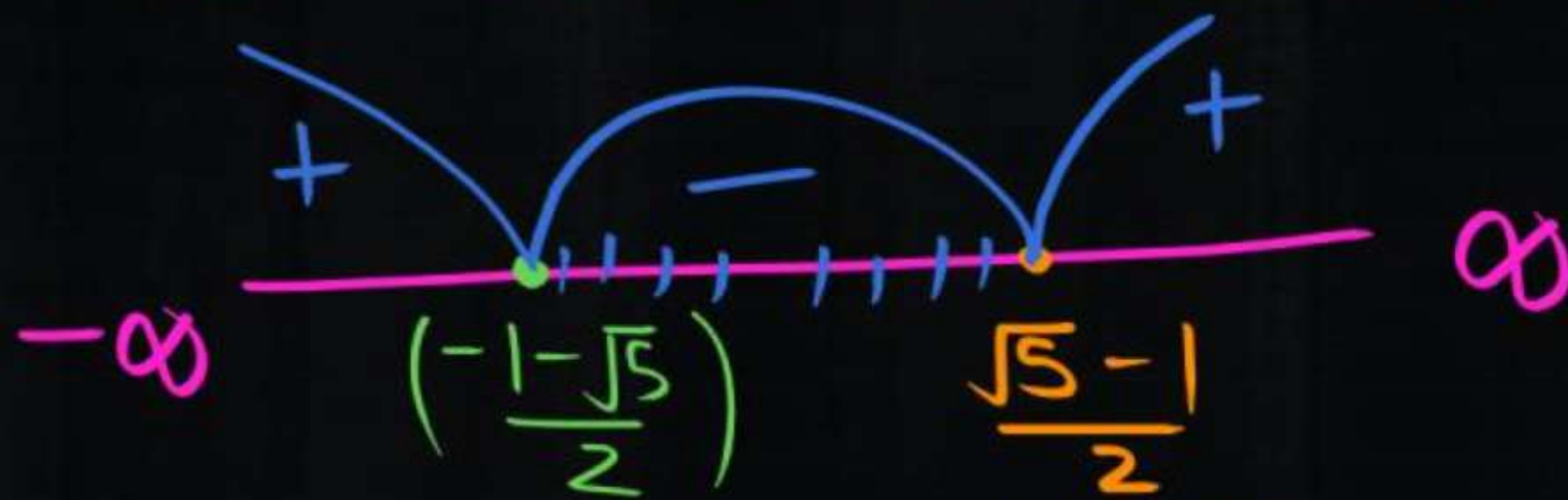
linear factors

$$\left(x - \left(-\frac{1-\sqrt{5}}{2}\right)\right) \left(x - \left(-\frac{1+\sqrt{5}}{2}\right)\right) \leq 0$$

$$x = \frac{-1 \pm \sqrt{1+4}}{2}$$

$$x = -\frac{1-\sqrt{5}}{2}, -\frac{1+\sqrt{5}}{2}$$

# Roots  $\rightarrow \alpha, \beta$   
 $(x-\alpha)(x-\beta)$



$$\approx 0.62$$

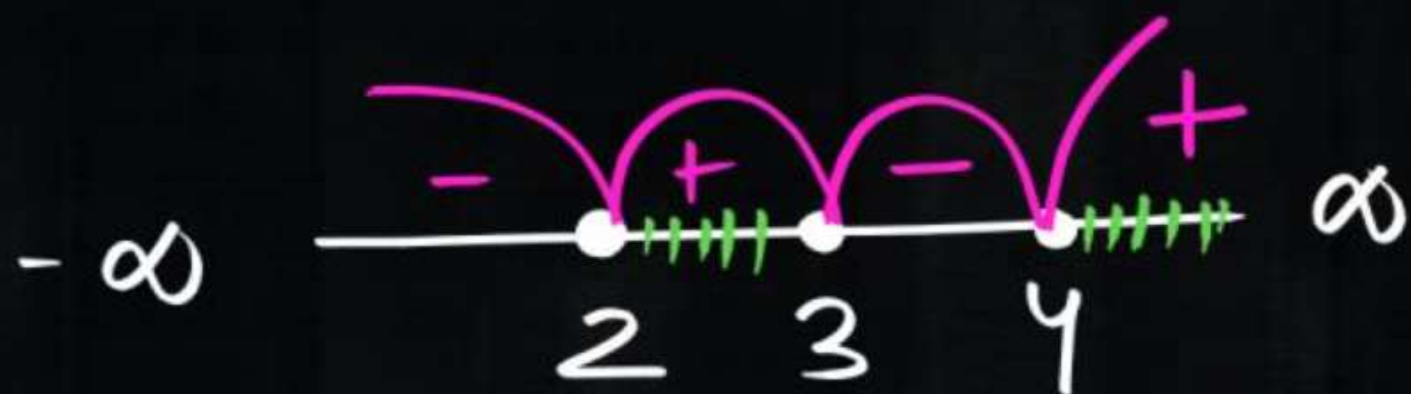
$$\text{Ans} \rightarrow x \in \left[-\frac{1-\sqrt{5}}{2}, \frac{\sqrt{5}-1}{2}\right]$$

$$\left. \begin{aligned} x - \left(-\frac{1+\sqrt{5}}{2}\right) &= 0 \\ x &= \frac{\sqrt{5}-1}{2} \approx 0.62 \end{aligned} \right\} \approx -1.62$$

?

Solve for  $x \rightarrow$ 

$$\underline{(x-2)}\underline{(x-3)}\underline{(x-4)} \geq 0$$



$$x \in [2, 3] \cup [4, \infty)$$

Ans.



?

Solve for  $x \rightarrow$ 

$$x^3 - 3x^2 - x + 3 \geq 0$$

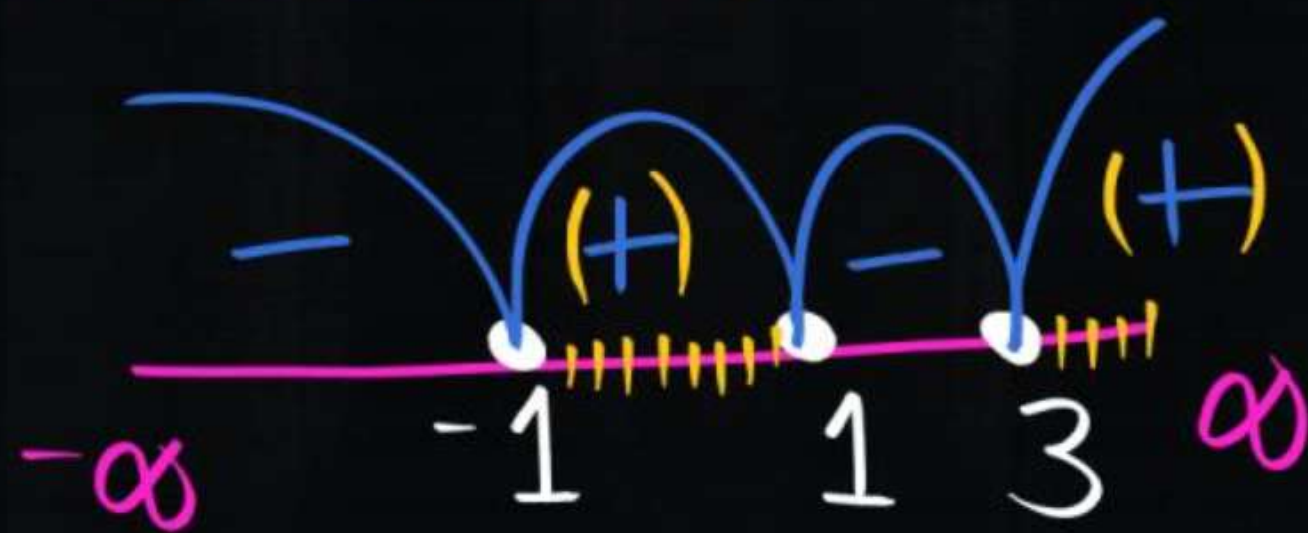
$$x^2(x-3) - 1(x-3) \geq 0$$

$$(x^2 - 1)(x - 3) \geq 0$$

$$\underline{(x-1)} \underline{(x+1)} \underline{(x-3)} \geq 0$$

$$x \in [-1, 1] \cup [3, \infty)$$

Ans







Solve the linear inequality  $5x - 7 > 3x + 16$

$$2x - 25 = 0$$
$$x = \frac{25}{2}$$

$$5x - 7 - 3x - 16 > 0$$
$$(2x - 25) > 0$$
$$x = \frac{25}{2}$$

$x \in \left(\frac{25}{2}, \infty\right)$  Ans

$$(25 - 25) > 0$$
$$0 > 0$$

(Invalid)



Solve the linear inequality  $1 - \frac{3x}{2} \leq x - 4$

(hw)





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Solve the linear inequality  $ax \leq 1$



Challenge  
Sawaal

(a) → positive  
→ Negative  
→ zero

$$(ax - 1) \leq 0$$

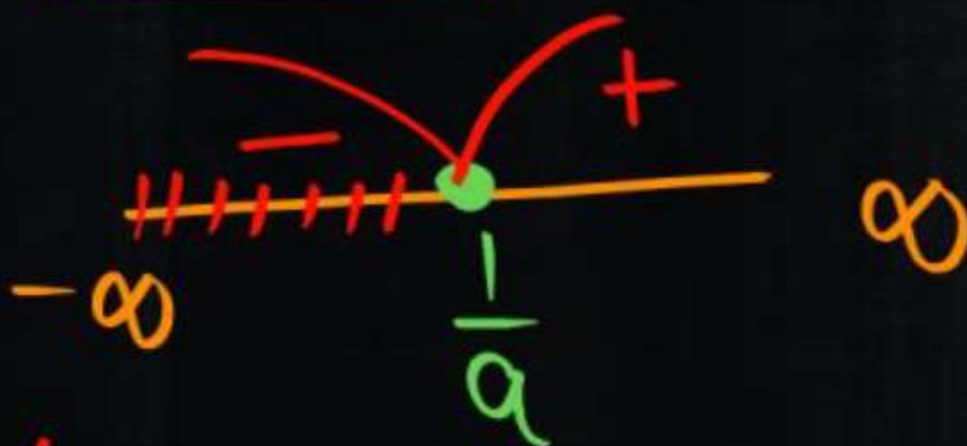
Case 1 →  $a > 0$

$$(ax - 1) \leq 0$$

$$ax - 1 = 0$$

$$x = \frac{1}{a}$$

$x = \frac{1}{a}$  →  $a\left(\frac{1}{a}\right) - 1 \leq 0$   
 $0 \leq 0$   
(valid)



✓  $x \in (-\infty, \frac{1}{a}]$



Case 2  $\rightarrow$   $a=0$

$$0 \cdot \overbrace{(x)} - 1 \leq 0$$

$-1 \leq 0$   $\rightarrow$  always True 

~~all real numbers~~  
 $-\infty$   $\infty$   
 all Real numbers  
 lie b/w  
 $-\infty$  and  $\infty$

$\checkmark$   $x \in \mathbb{R}$  OR  $x \in (-\infty, \infty)$   
 $x \in$  Real number  
 i.e.  $(-\infty, \infty)$

Case 3  $\rightarrow a < 0$   $\xrightarrow{\text{ex}} a = -2$   $\rightarrow (-a) = 2$

Dhyaan se Dekhna

multiply by  $(-1)$   $\rightarrow (ax - 1) \leq 0$

$\rightarrow -(ax - 1) \geq -0$

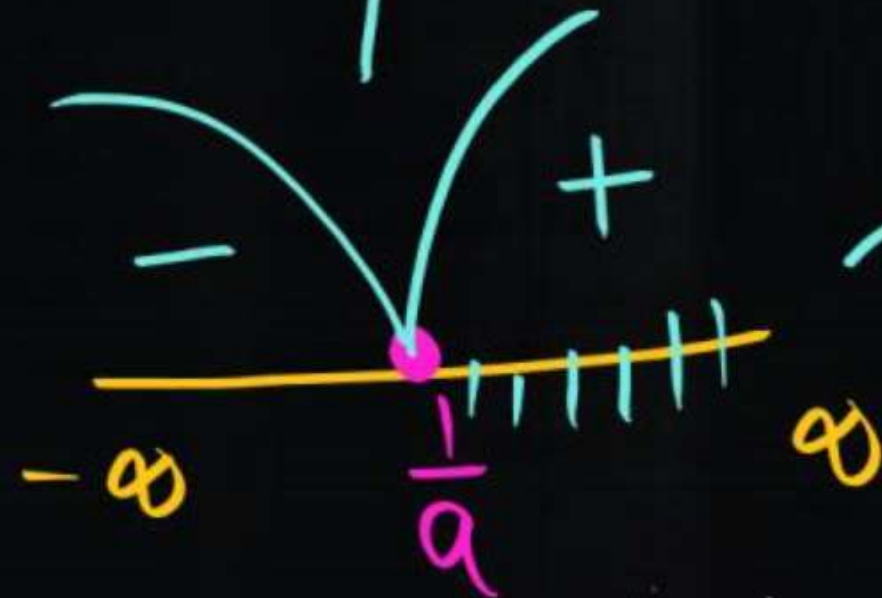
$\left\{ \begin{array}{l} (-a)x + 1 \geq 0 \\ \downarrow \\ \text{(Positive)} \end{array} \right\}$

$x = \frac{1}{a}$

$-1 + 1 \geq 0$   
 $\underline{0 \geq 0}$   
Valid

$(-a) > 0$

$-ax + 1 = 0$   
 $x = \frac{1}{a}$



$x \in \left[ \frac{1}{a}, \infty \right)$



final ans ↓

$$\text{when } a > 0, x \in (-\infty, \frac{1}{a}]$$

$$\text{when } a = 0, x \in \mathbb{R} \quad \text{or } x \in (-\infty, \infty)$$

$$\text{when } a < 0, x \in [\frac{1}{a}, \infty)$$

Ans





**THANK - YOU**

**JBK...JBK...JBK..**