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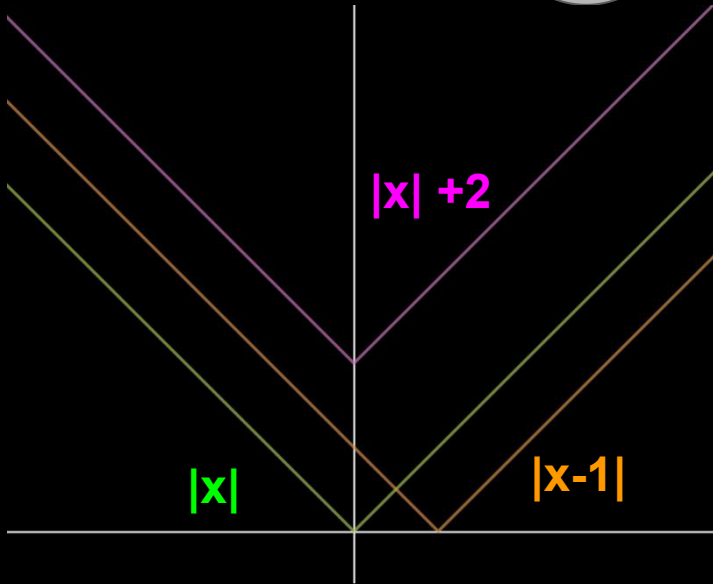
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# Functions

LECTURE

4

Modulus Function - 1





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### 11th Physics

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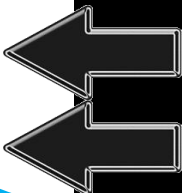
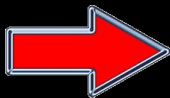
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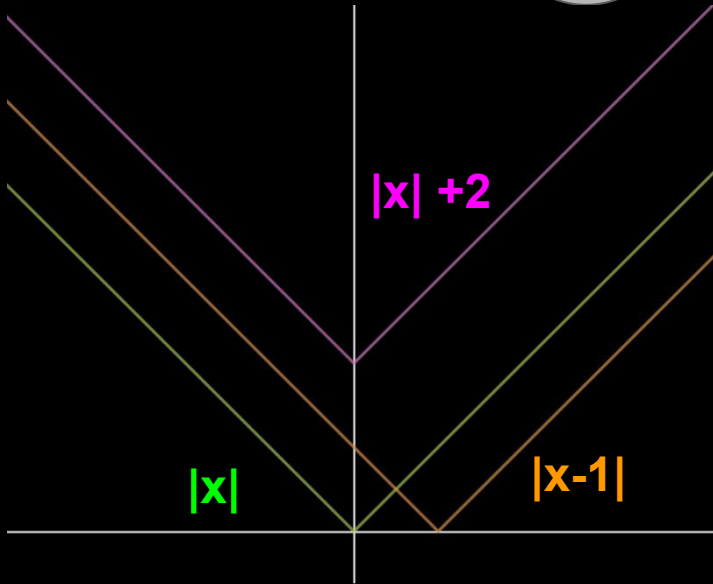
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# Functions

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Modulus Function - 1



# Modulus Function : Definition

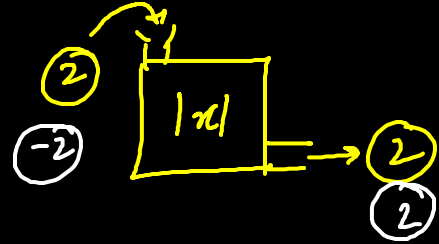
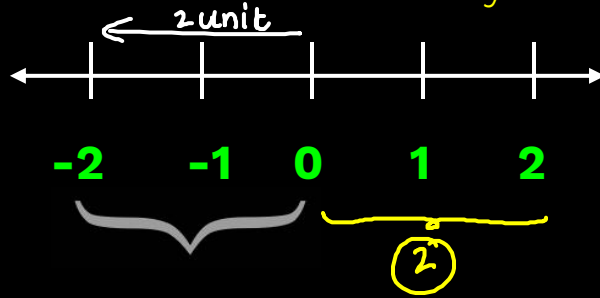
The modulus/absolute value of a number may be thought of as its distance from zero.

$$|-2| = 2 \quad |2| = 2$$

## Definition

$$|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0. \end{cases}$$

$$|-2| = -(-2) = 2$$



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

# Modulus Function: (Domain, Range and Graph)

$$|-\pi| = \pi$$

$$|0| = 0$$

$$|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$$

Domain:  $\mathbb{R}$

input value.

Range:  $[0, \infty)$

output values

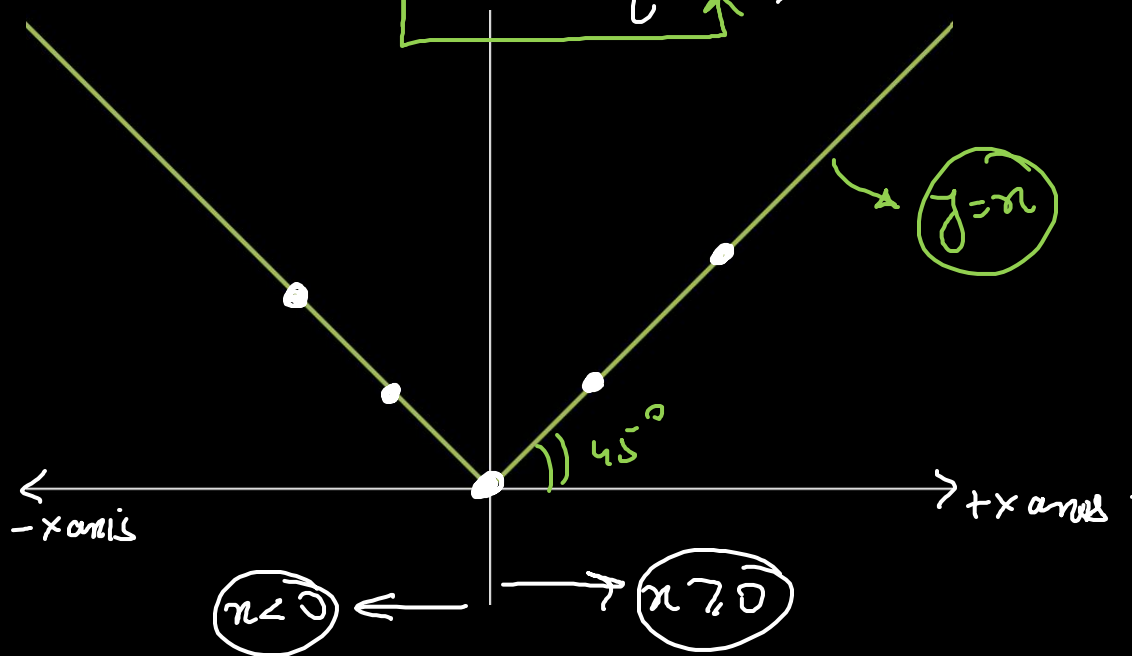
# Modulus Function: (Domain, Range and Graph)

Graph

$$y = |x| = \begin{cases} x & ; x \geq 0 \\ -x & ; x < 0 \end{cases}$$

$x$	0	1	2	-1	-2
$y$	0	1	2	1	2

\*





# Opening Modulus Function

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

eg:  $|x-1|$

$$x=10 \rightarrow (10-1) = 9$$

$$x=-5 \rightarrow -(-5-1) = 6$$

andaz  
kya  
likha  
hai

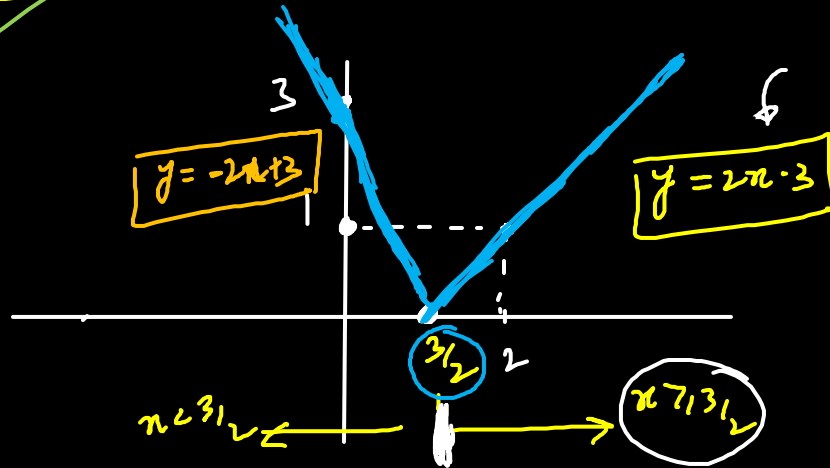
$$|x-1| = \begin{cases} (x-1) & ; (x-1) \geq 0 \Rightarrow x \geq 1 \\ -(x-1) & ; (x-1) < 0 \Rightarrow x < 1 \end{cases}$$

### Example

Define  $f(x)$  free of modulus and draw the graph:

(i)  $f(x) = |2x - 3|$

$$f = \begin{cases} (2x - 3) & ; (2x - 3) \geq 0 \rightarrow x \geq 3/2 \\ -(2x - 3) & ; (2x - 3) < 0 \rightarrow x < 3/2 \end{cases}$$



eg:

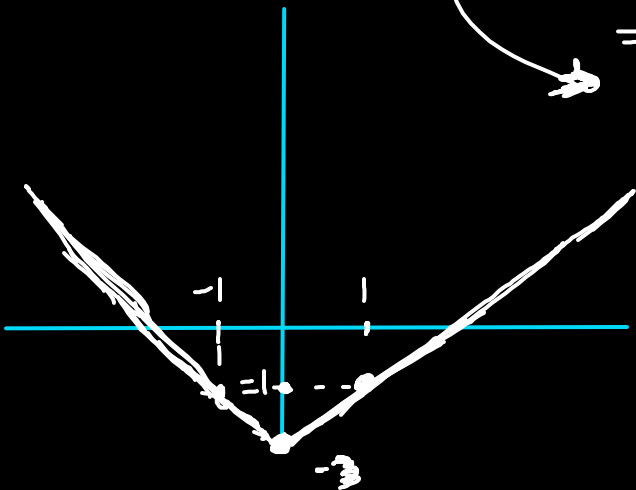
$$|2| = 2$$
$$|-2| = (-2) = 2$$

### Example

Define  $f(x)$  free of modulus and draw the graph:

$$(ii) f(x) = |2x| - 3$$

$$= \begin{cases} \underline{(2x)} - 3 & ; \textcircled{2x} \geq 0 \rightarrow \boxed{x \geq 0} \\ -\underline{(2x)} - 3 & ; \textcircled{2x} < 0 \rightarrow \boxed{x < 0} \end{cases}$$
$$= \begin{cases} 2x - 3 & ; \boxed{x \geq 0} \\ -2x - 3 & ; \textcircled{x < 0} \end{cases}$$



# Opening Modulus Function

\*



NOTE

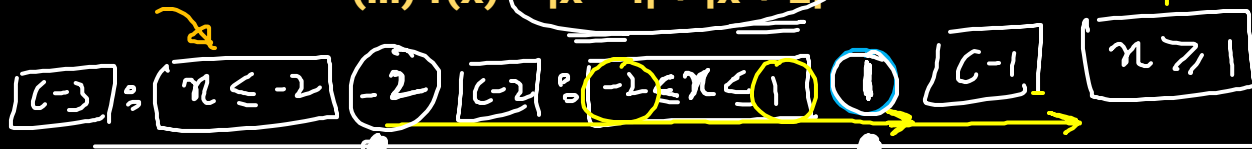
On the right of critical point modulus opens with a plus sign and on the left it opens with a minus sign.

$$\begin{array}{c}
 \textcircled{-3} \rightarrow |2x+5| = \begin{cases} (2x+5) ; & \boxed{x \geq -5/2} \\
 -(2x+5) ; & \boxed{x < -5/2} \end{cases} \\
 \begin{array}{c} \nearrow \\ \text{critical} \\ \text{point} \searrow \end{array} \rightarrow \textcircled{-5/2}
 \end{array}$$

# Example

Define  $f(x)$  free of modulus and draw the graph:

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



$$y = f(x) = \begin{cases} -2x - 1; & x \leq -2 \\ 3; & -2 < x < 1 \\ 2x + 1; & x \geq 1 \end{cases}$$

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

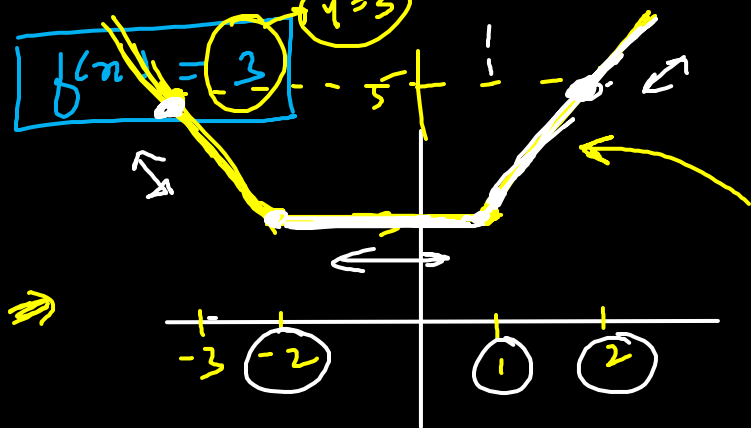
$$f(x) = -2x - 1$$

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

$$f(x) = 3$$

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

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



# Example

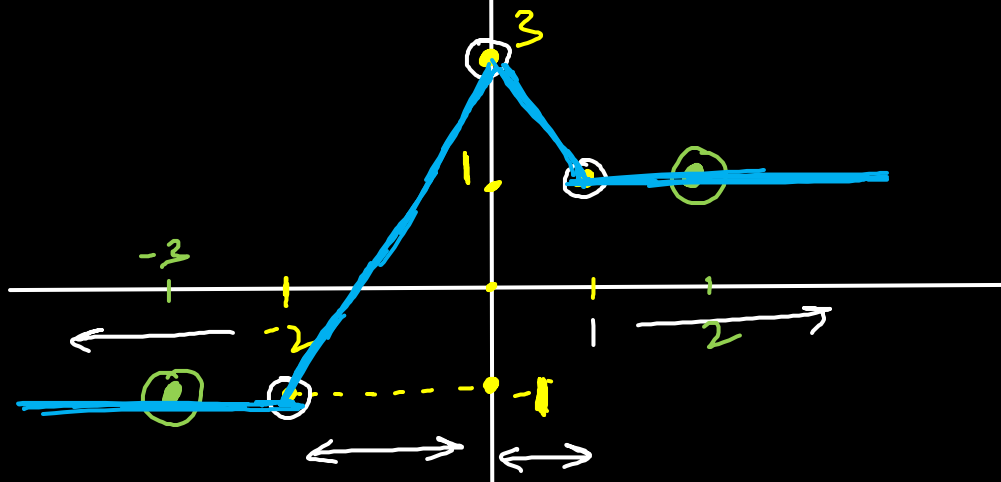
Define  $f(x)$  free of modulus and draw the graph:

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

	$x = -2$	$x = 0$	$x = 1$
$ x - 1 $	3	1	0
$ x + 2 $	0	2	3
$-2 x $	-4	0	-2

C.P.  $\rightarrow$   $\boxed{-2, 0, 1}$

Extra values:  $2, -3$   
 $\downarrow \quad \downarrow$   
 $\textcircled{1}$



Shortcut  
to draw  
graph

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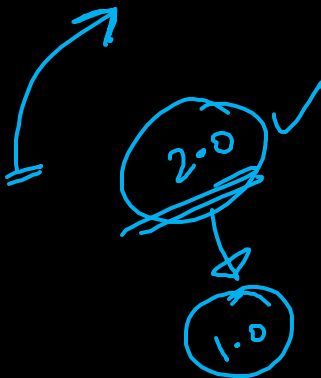
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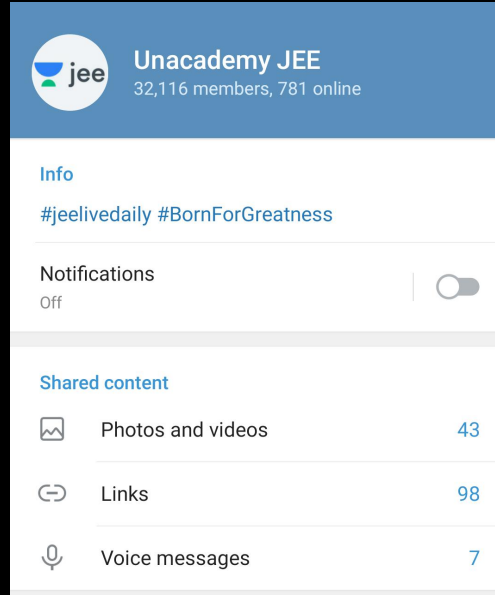
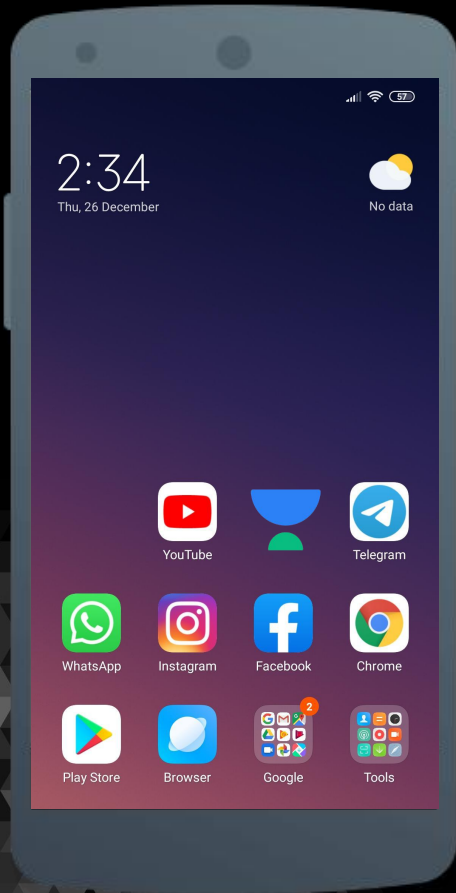
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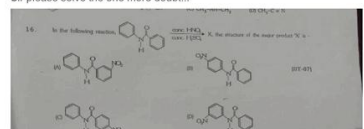


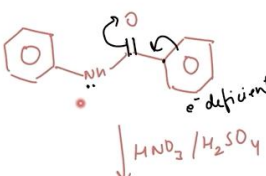
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Question

**ROHIT SACHAN:**  
Sir please solve the one more doubt...





↓  $\text{HNO}_3 / \text{H}_2\text{SO}_4$

NO<sub>2</sub><sup>+</sup>

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Sinchan Dutta  
Chaudhuri  
right

Shoaib Alam Left

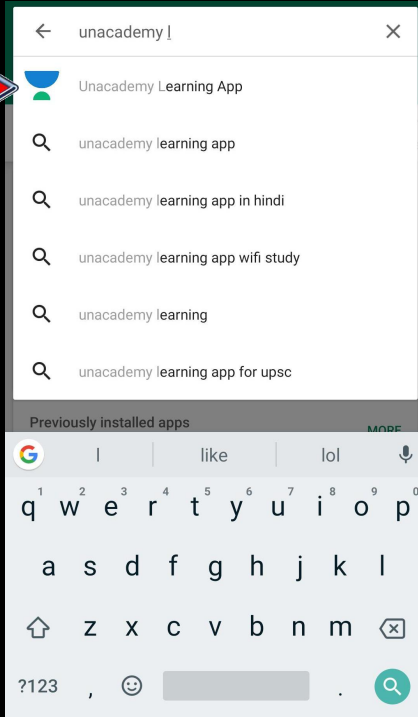
Vsvsgsg Right

Prashant Singh joined

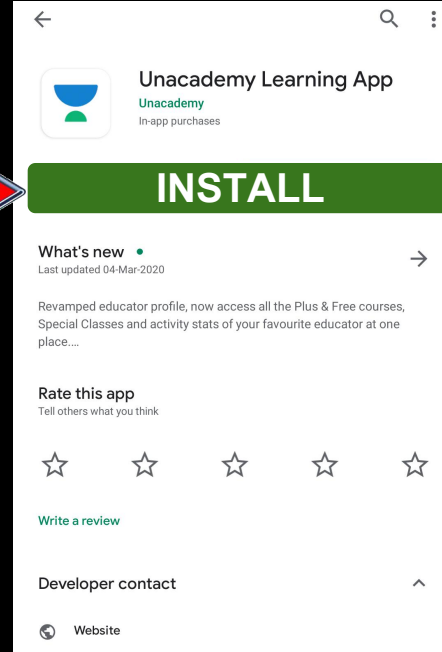
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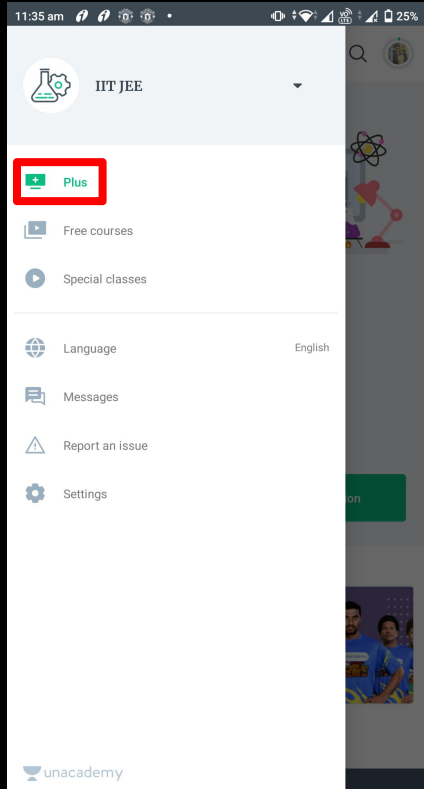
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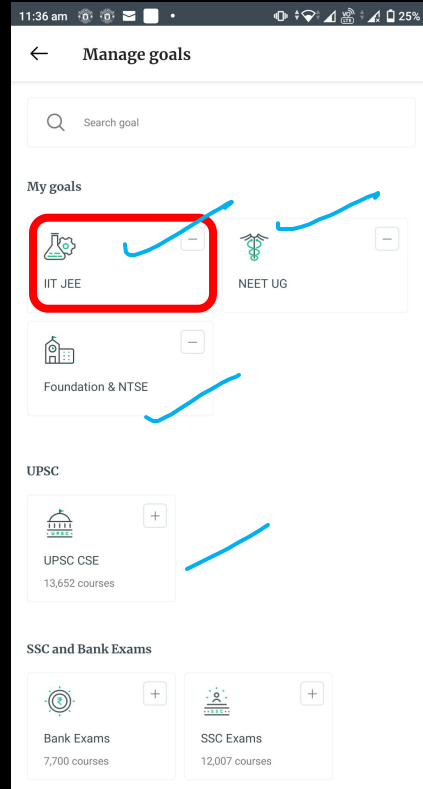
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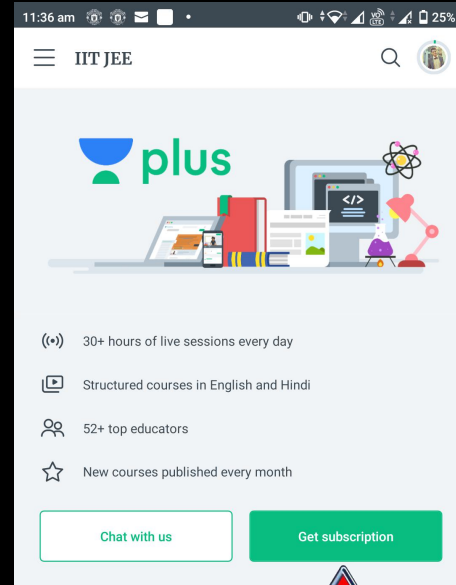
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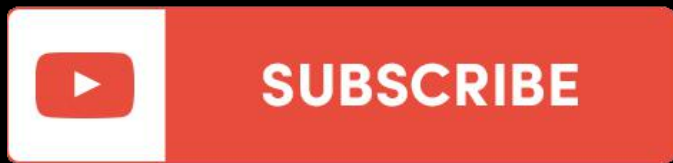
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