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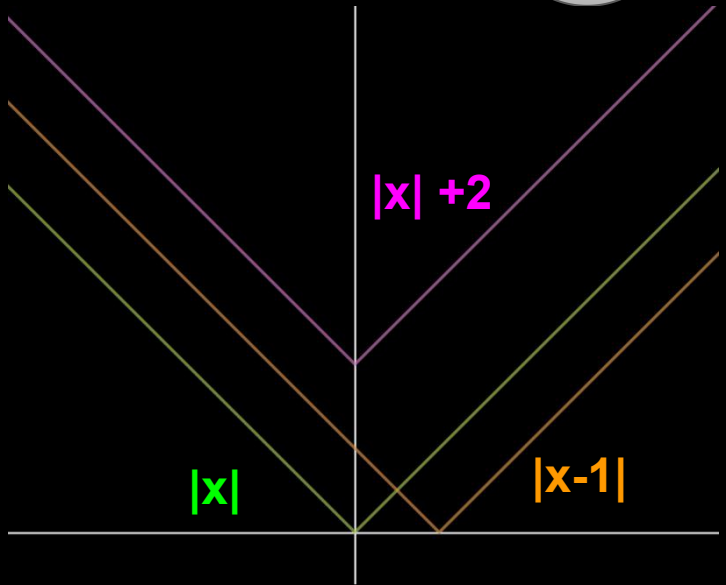
Functions

LECTURE 4

Modulus Function - 1



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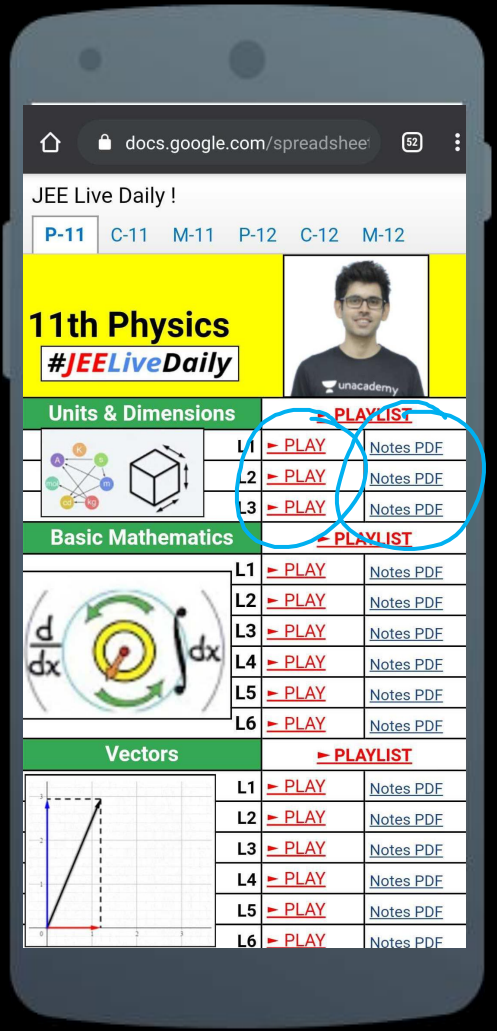

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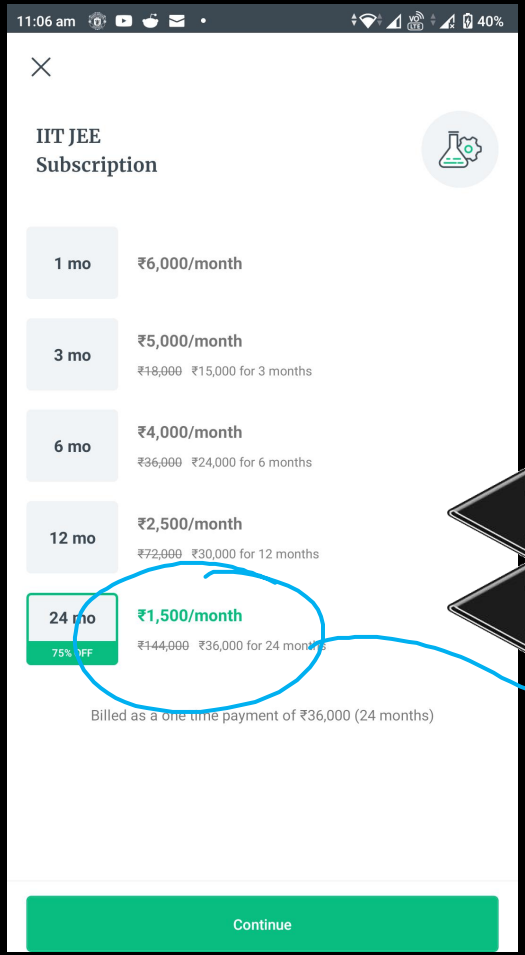

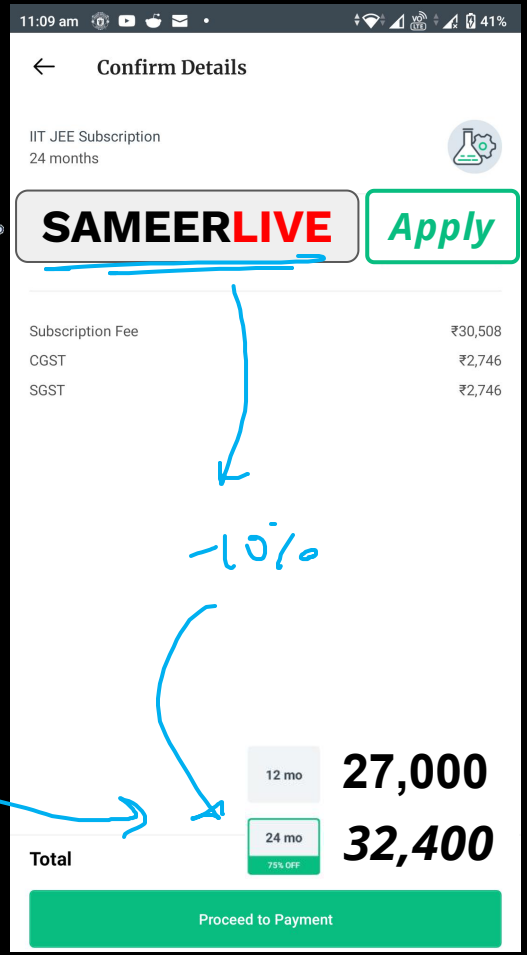

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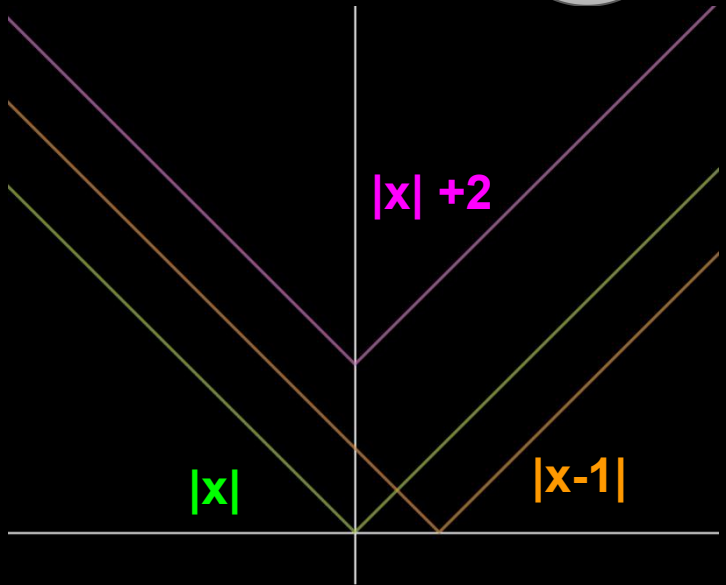
Functions

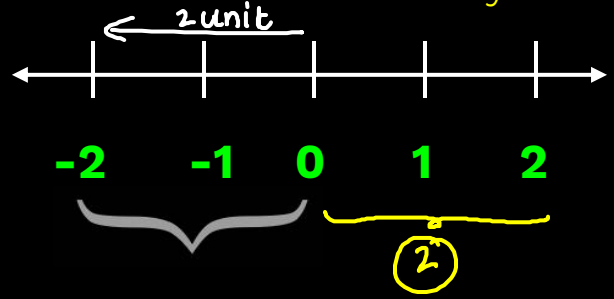
LECTURE 4

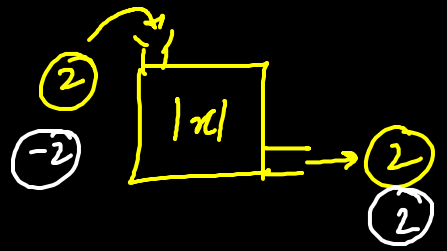
Modulus Function - 1



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

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

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

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

Modulus Function: (Domain, Range and Graph)

$|-\pi| = \pi$ $\quad$ $|0| = 0$

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

Domain: R

input value.

Range: [0, ∞)

output values

Modulus Function: (Domain, Range and Graph)

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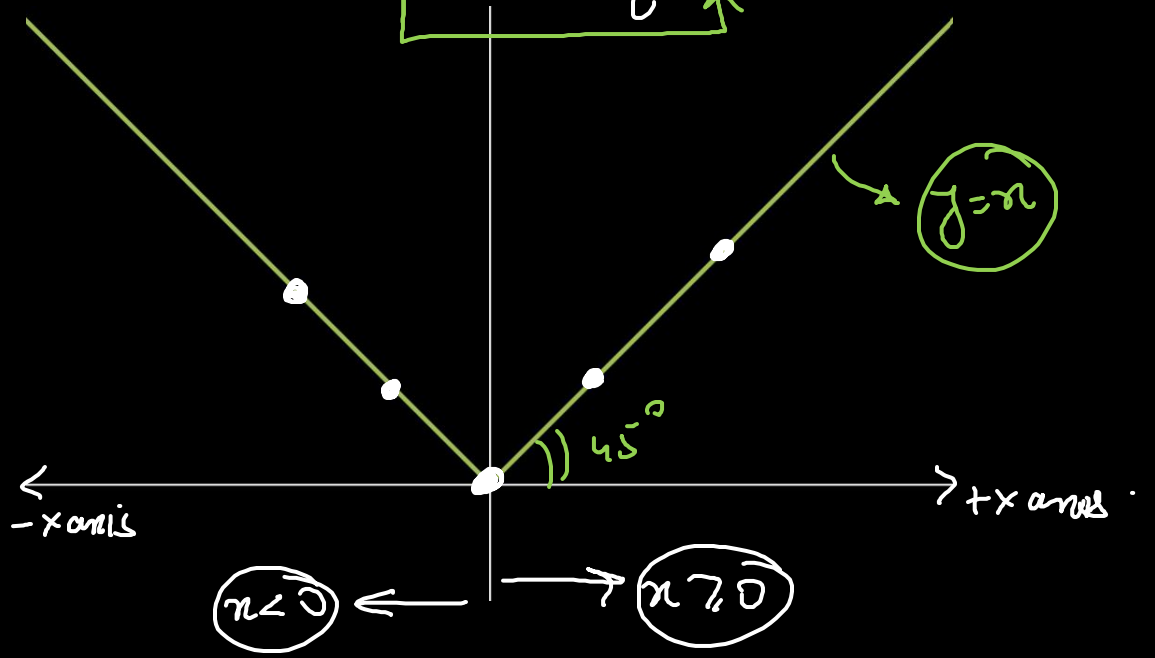
Graph

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

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: $|x-1|$

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

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

andar 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

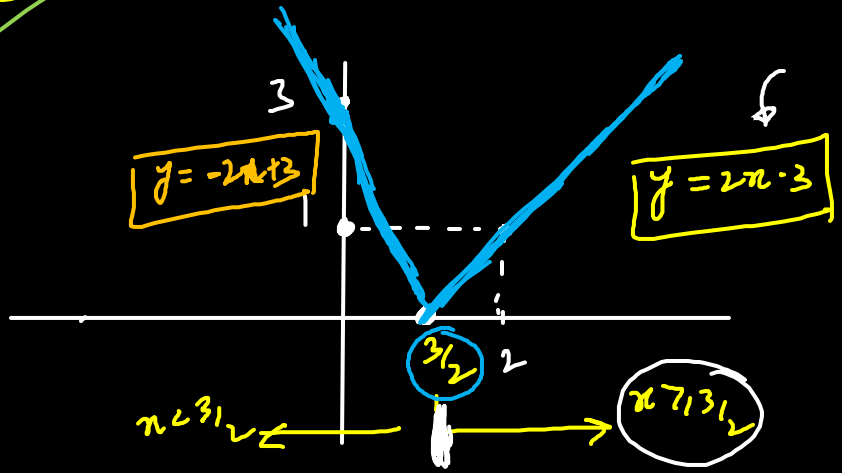
Define f(x) free of modulus and draw the graph:

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

$y = f(x)$

Eg: $|2| = 2$, $|-2| = -(-2) = 2$

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



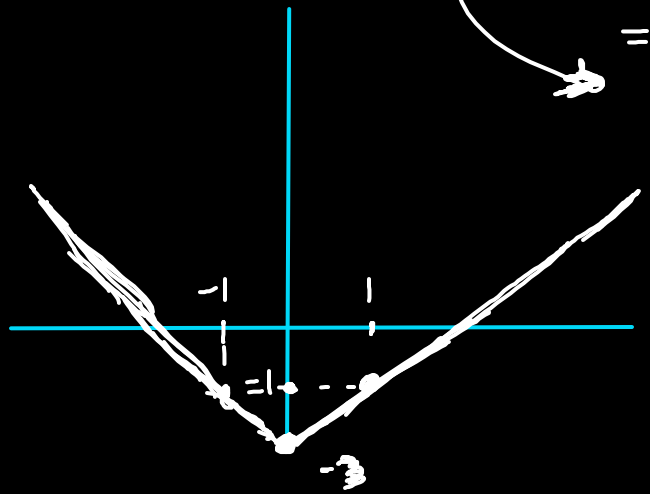
Example

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

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

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

$$= \begin{cases} 2x - 3 & ; x \geq 0 \\ -2x - 3 & ; x < 0 \end{cases}$$



Opening Modulus Function

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

$$|2x+5| = \begin{cases} (2x+5) & ; \ x \geq -5/2 \\ -(2x+5) & ; \ x < -5/2 \end{cases}$$

(-3)

Critical point → $-5/2$

Example

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

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

$(-\infty, -2]$: $x \le -2$ | -2 | $(-2, 1]$: $-2 \le x \le 1$ | 1 | $(1, \infty)$: $x \ge 1$

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

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

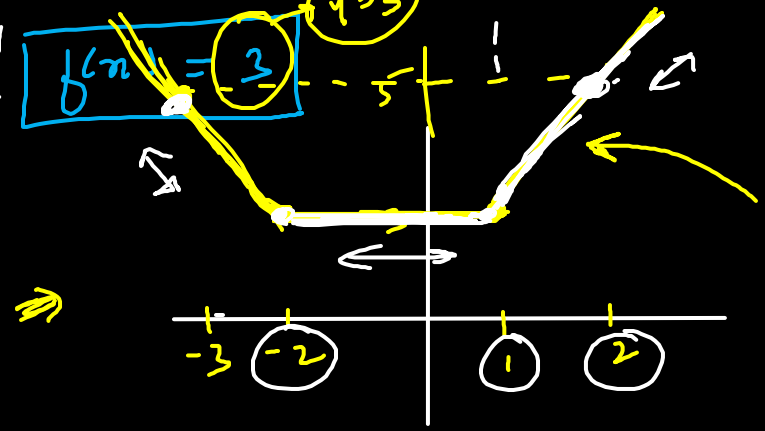
$f(x) = -(x-1) + (x+2)$

$f(x) = 3$

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

$f(x) = 2x + 1$

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



Example

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

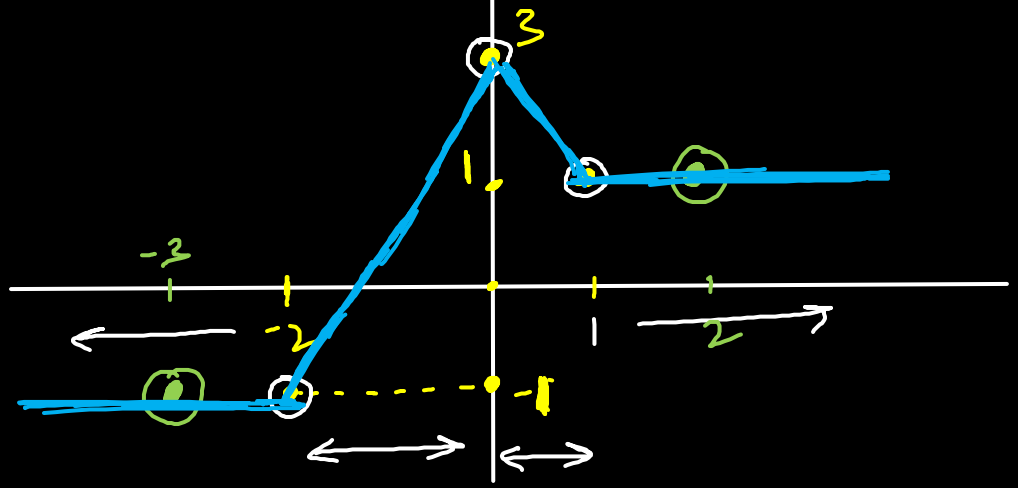
(iv) f(x) = |x - 1| + |x + 2| - 2|x|

Shortcut to draw graph

C.P. → -2, 0, 1

Extra values : 2, -3

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



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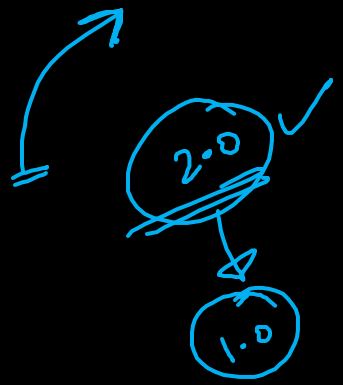

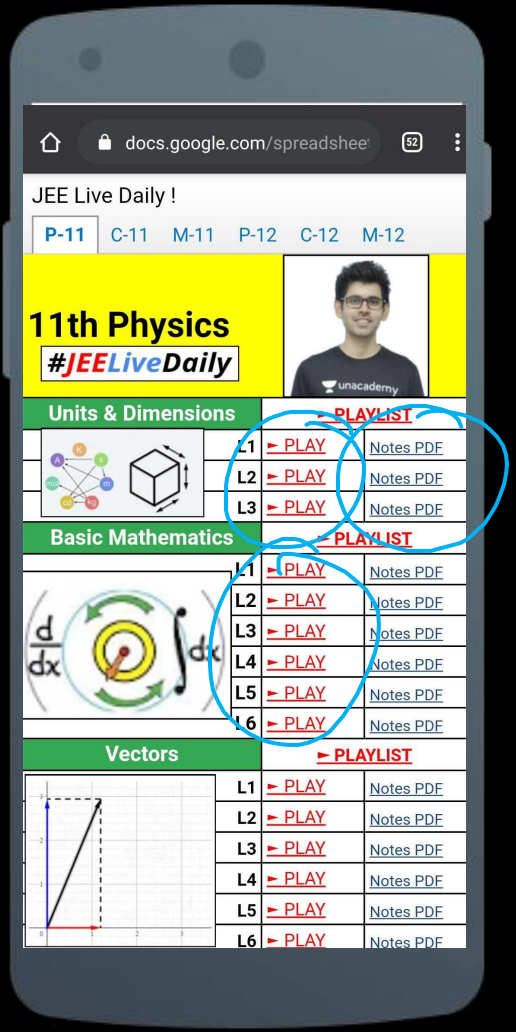

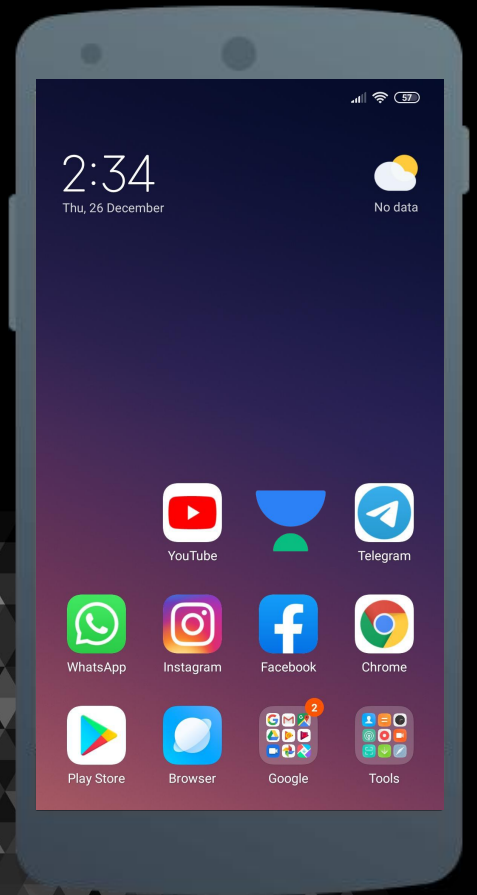

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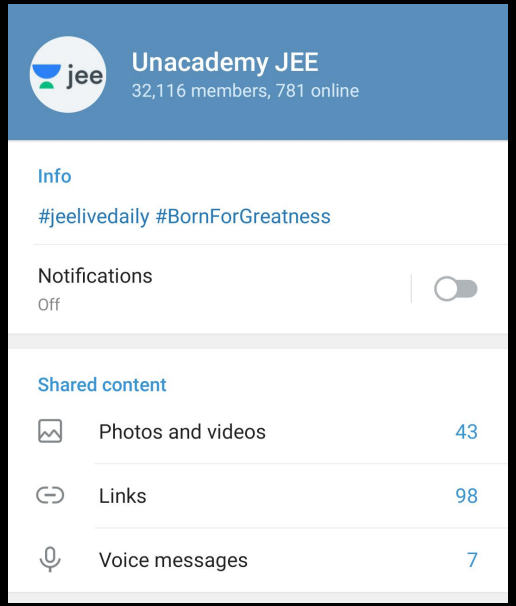

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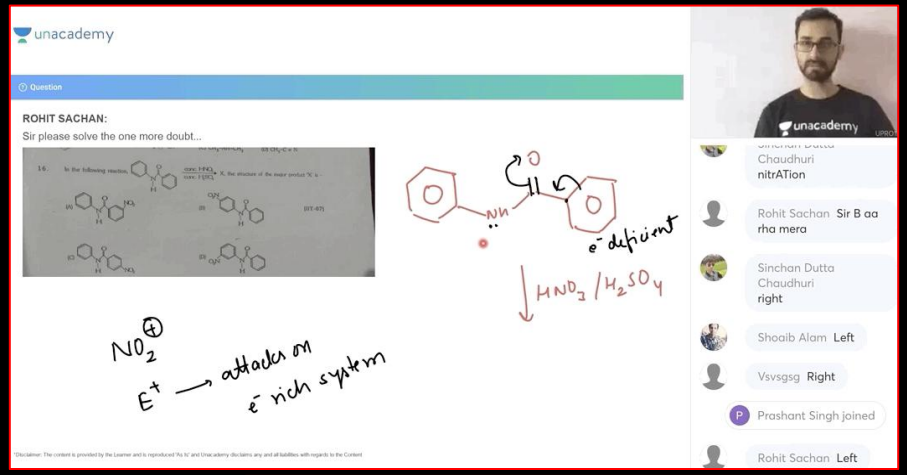

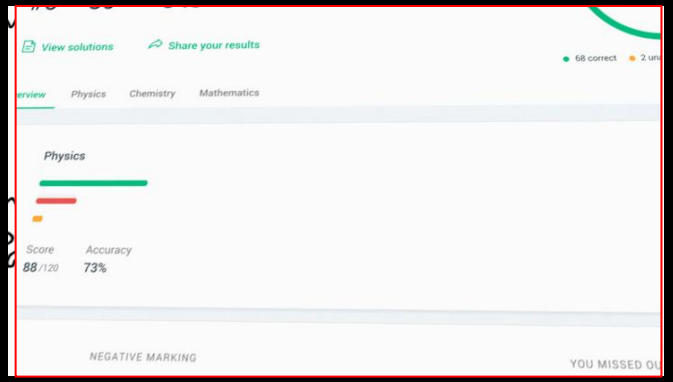

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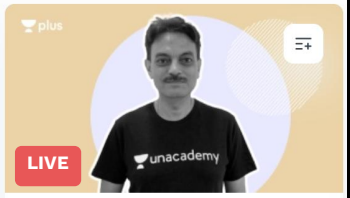

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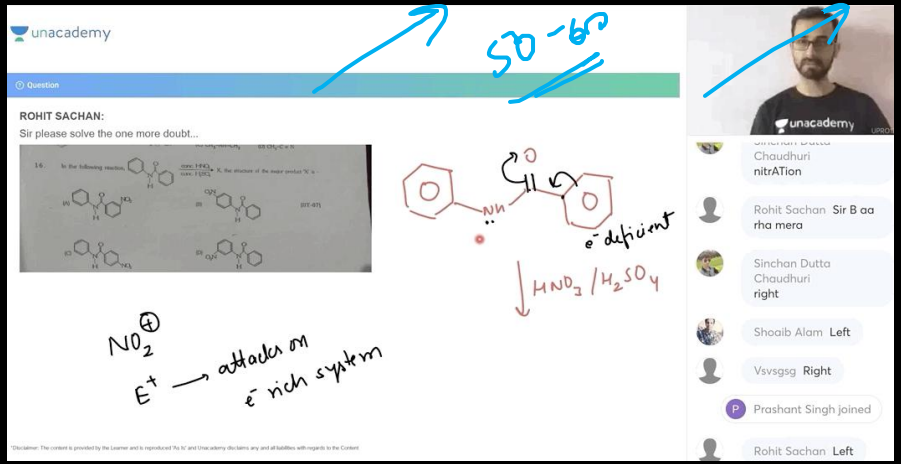

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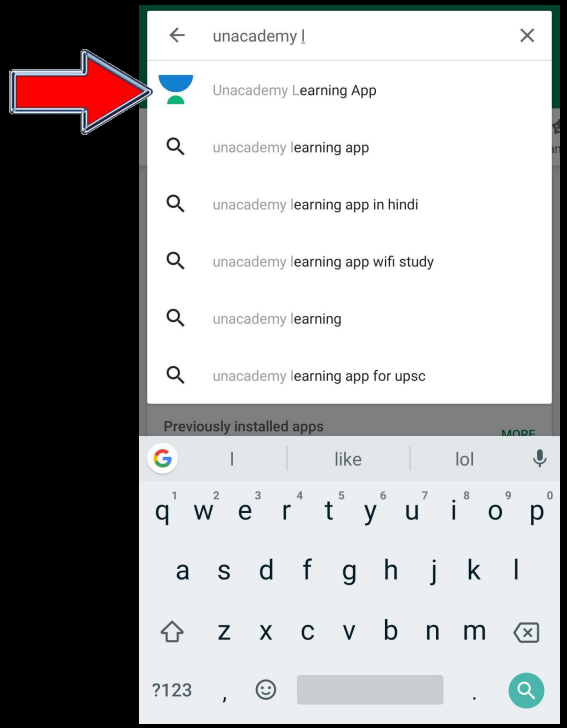
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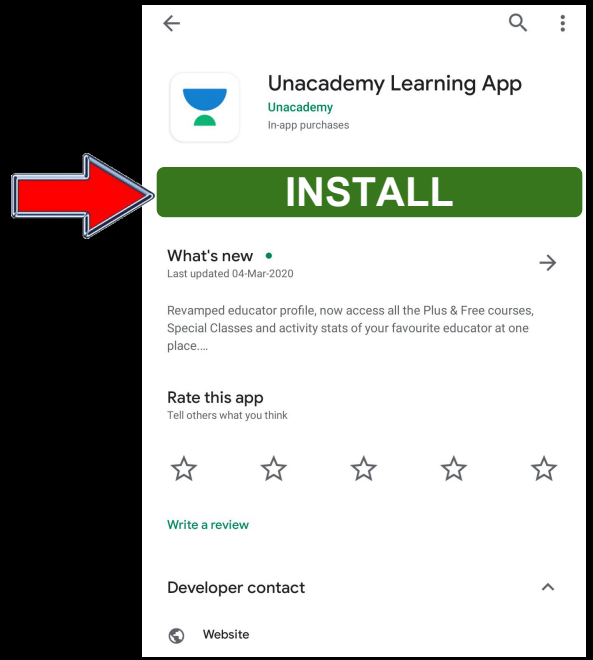
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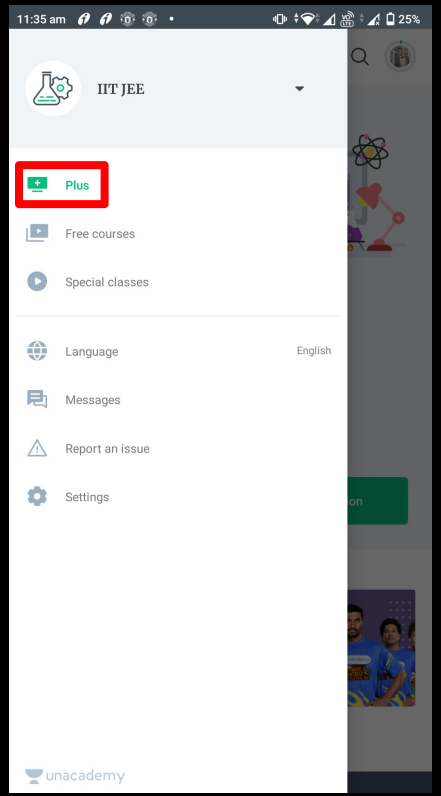

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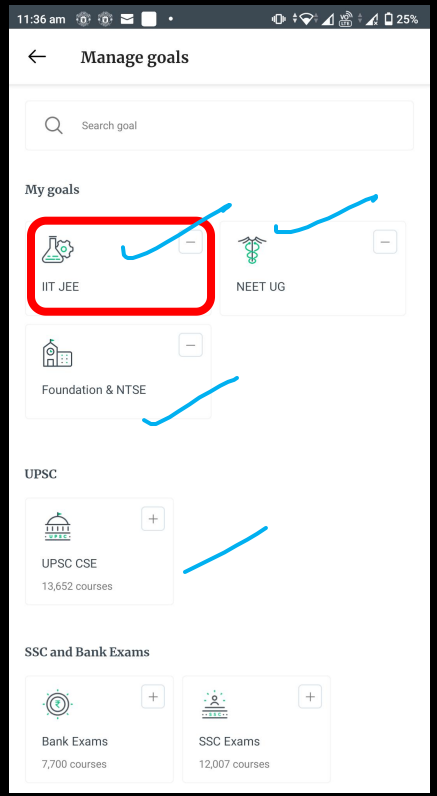

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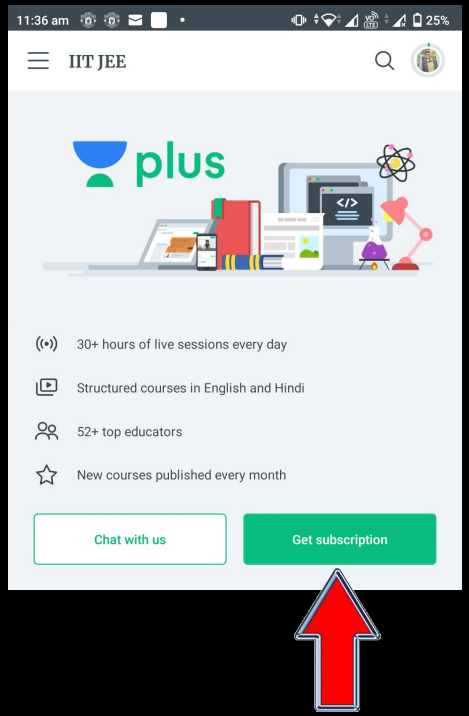

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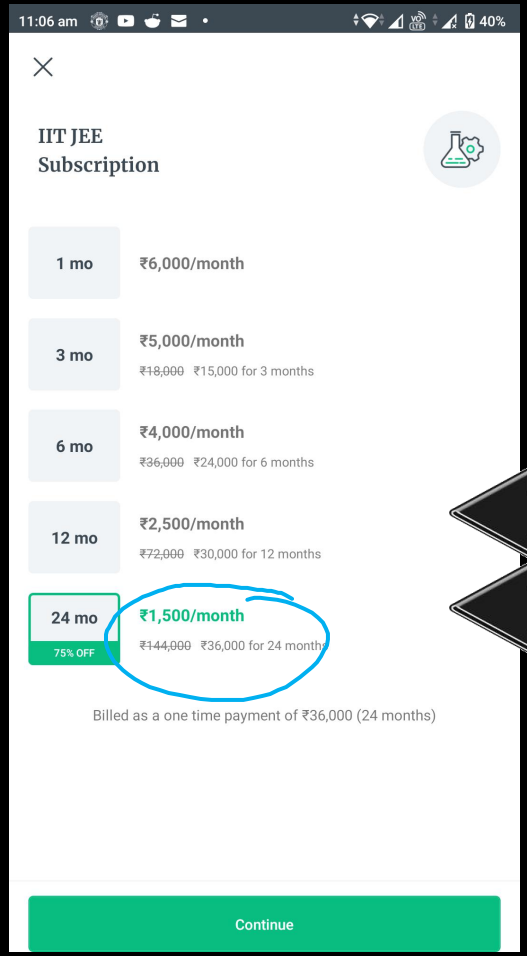

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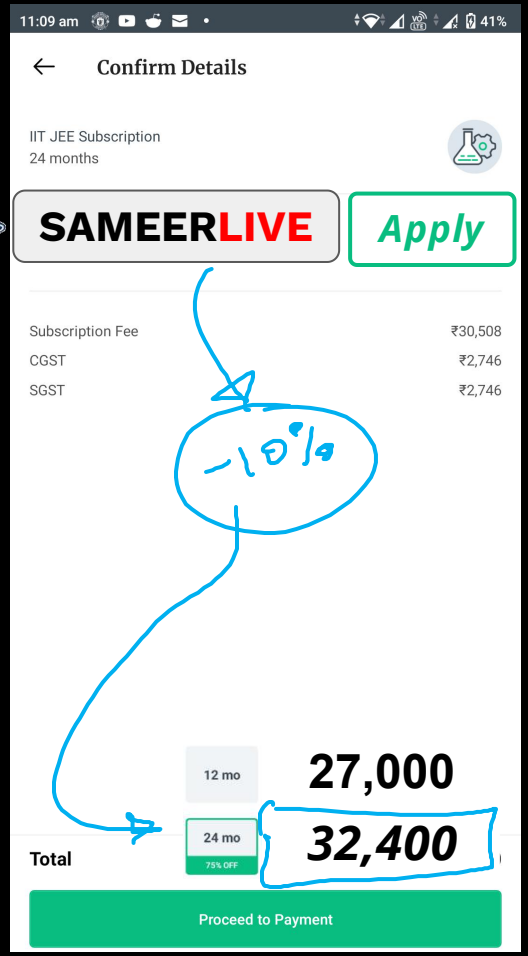

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