#2

PhD ON CHAIN ON A TABLE

(NLM + WEP)

Mohit Goenka | IIT Kharagpur

EDUNITI

EDUNITI YouTube Channel
Learn Like Never Before

List of Content on Eduniti YouTube Channel:

1. PYQs Video Solution Topic Wise:
   (a) JEE Main 2018/2020/2021 Feb & March
2. Rank Booster Problems for JEE Main
3. Part Test Series for JEE Main
4. JEE Advanced Problem Solving Series
5. Short Concept Videos
6. Tips and Tricks Videos
7. JEE Advanced PYQs
8. Formulae Revision Series

.....and many more to come

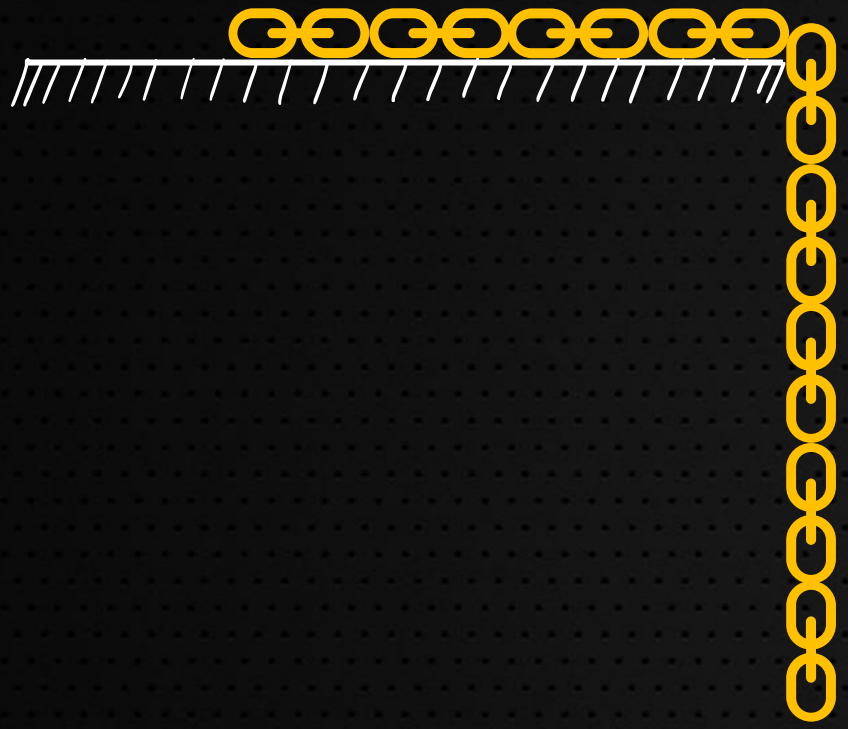
EDUNITI

Eduniti for Physics

EDUNITI

Chain on Table

NLM + WEP



JEE MAIN

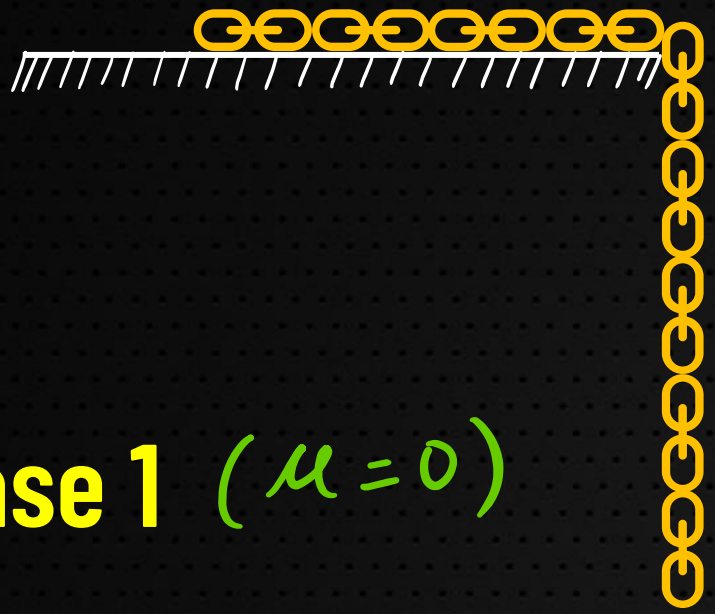
WORK ENERGY POWER FORMULAE

Now that's how you REVISE

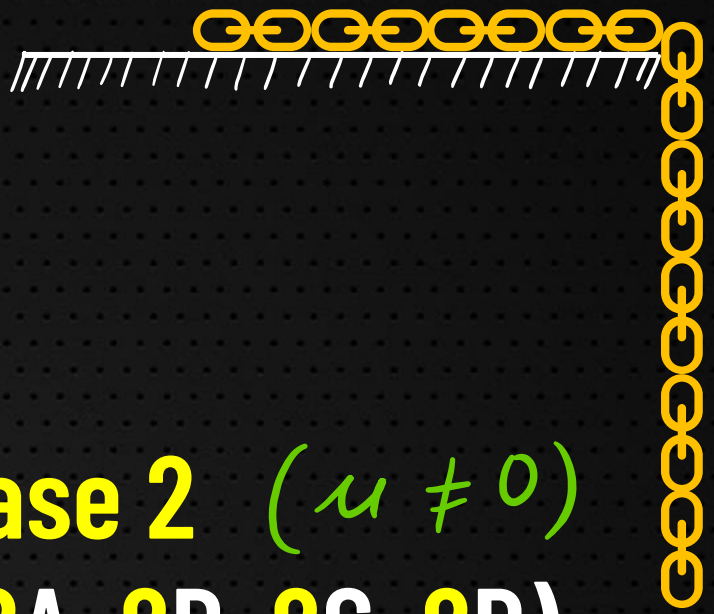
https://youtu.be/kjrXoE-kDI8

"JOIN"

Eduniti for Physics



Case 1 ($\mu = 0$)



Case 2 ($\mu \neq 0$)

(2A, 2B, 2C, 2D)

EDUNITI

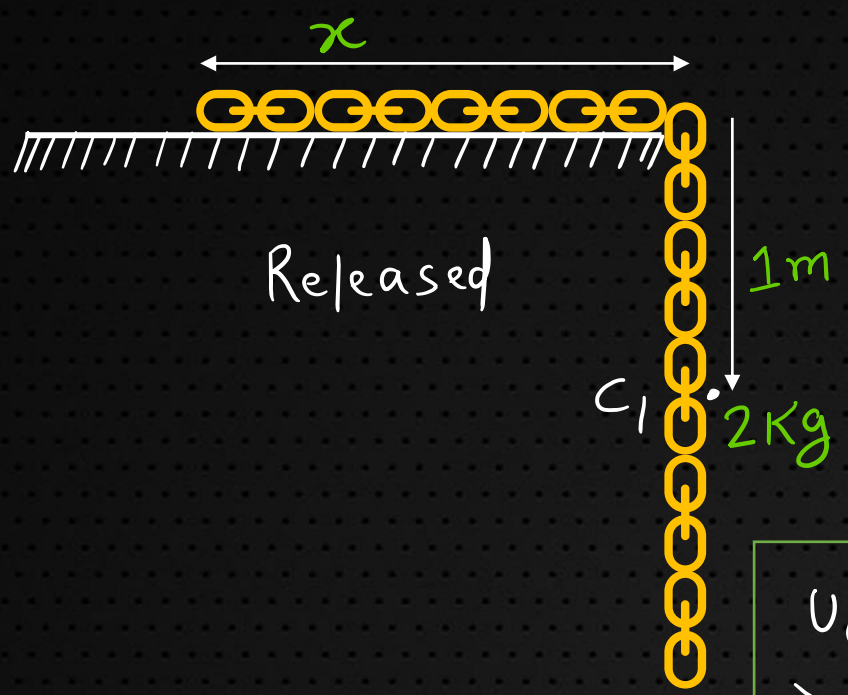
Case 1

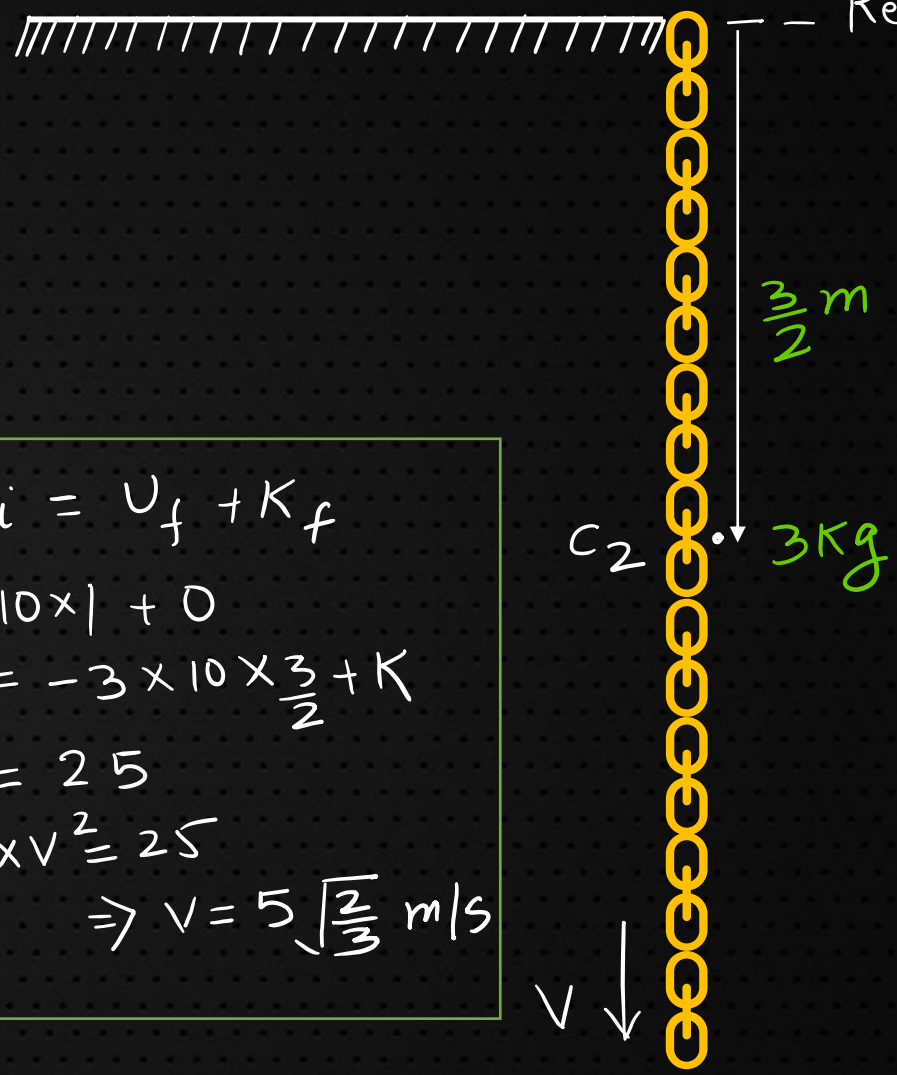
(U=0)

$L = 3m$

$x = 1m$

$M = 3kg$





$U_i + K_i = U_f + K_f$

$\Rightarrow -2\times10\times1 + 0 = -3\times10\times\frac{3}{2} + K$

$\Rightarrow K = 25$

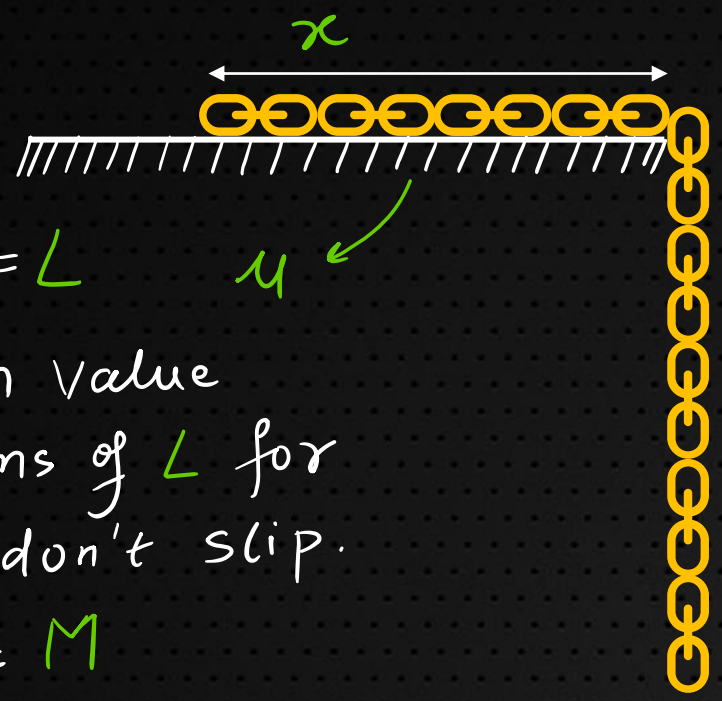
$\Rightarrow \frac{1}{2}\times3\times v^2 = 25$

$\Rightarrow v = 5\sqrt{\frac{2}{3}}$ m/s

Eduniti for Physics

EDUNITI

Case 2A



Chain Length = L

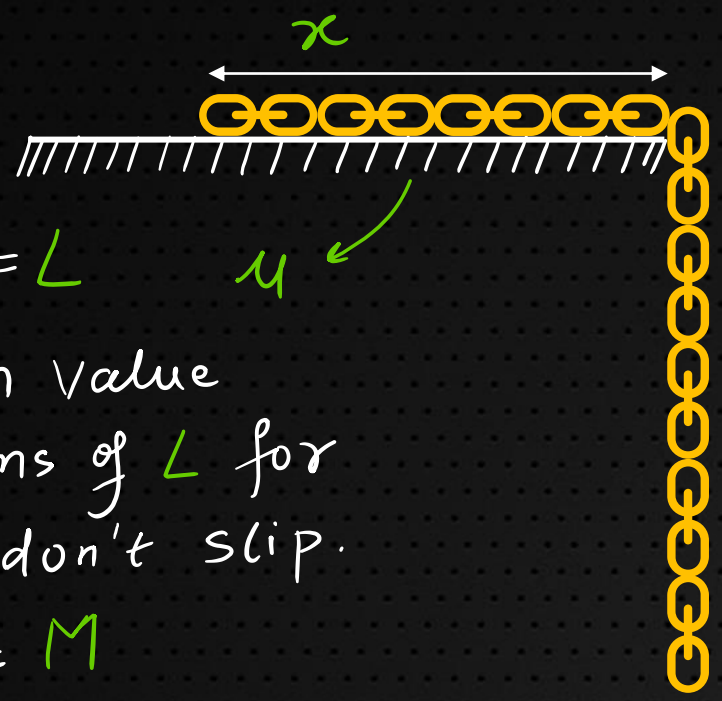
Find minimum value of x in terms of L for which chain don't slip.

Chain Mass = M

Eduniti for Physics

EDUNITI

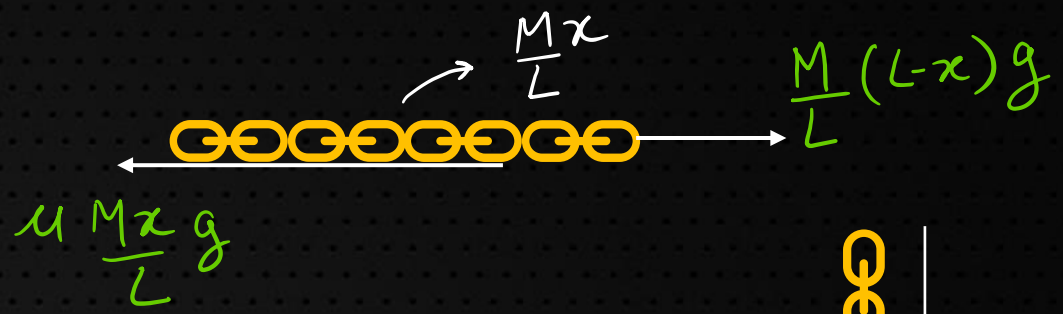
Case 2A



Chain Length = L

Find minimum value of x in terms of L for which chain don't slip.

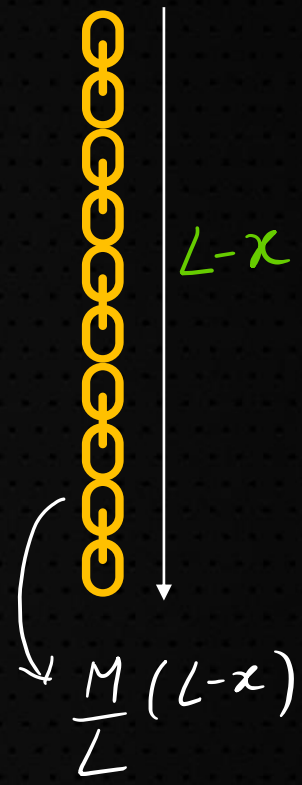
Chain Mass = M



$$\therefore \mu \frac{Mx}{L} g = \frac{M}{L}(L-x)g$$

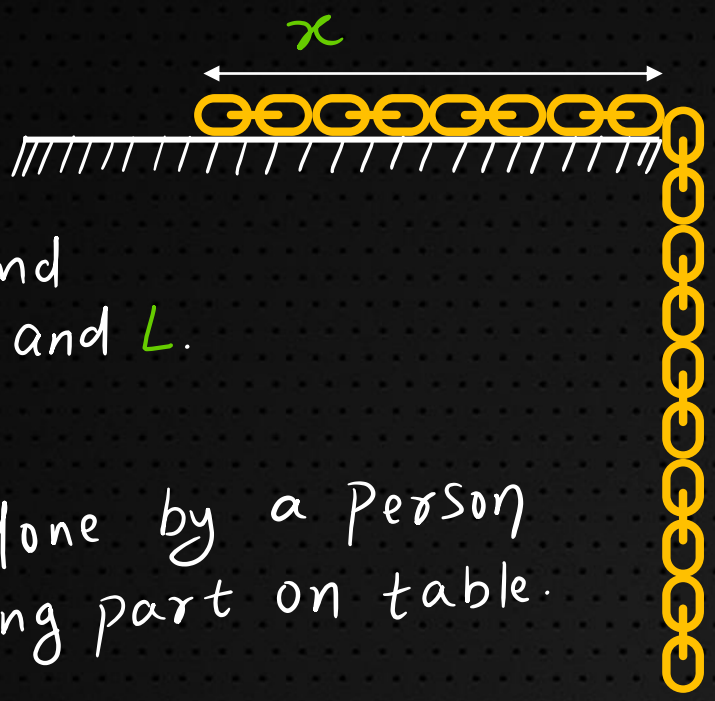
$$\Rightarrow \mu x = L - x$$

$$\Rightarrow \boxed{x = \frac{L}{1+\mu}}$$



Eduniti for Physics

Case 2B



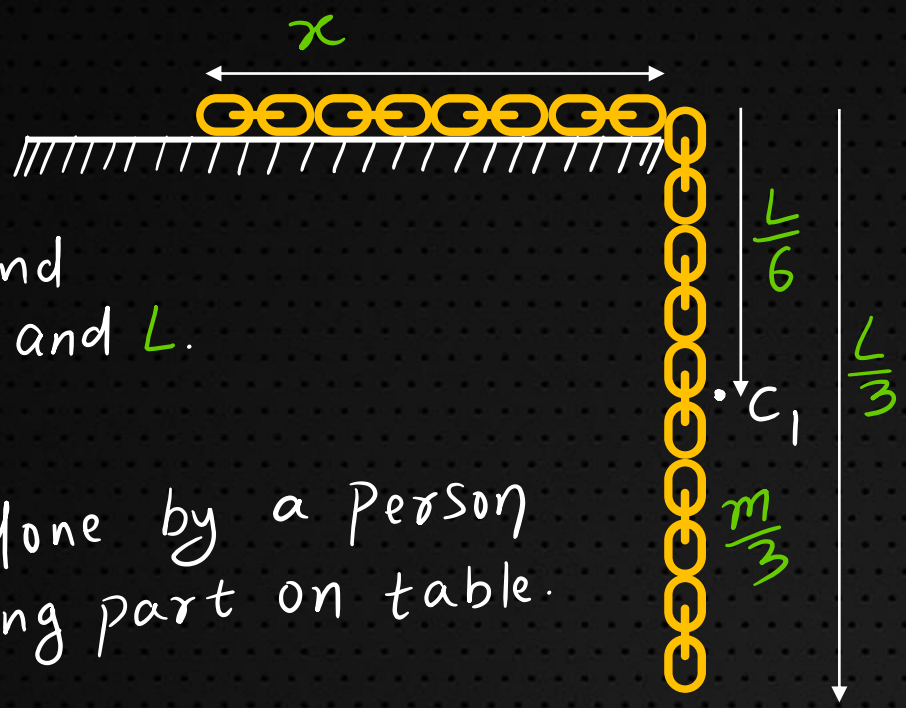
Chain mass and
Length is m and L.

$x = 2L/3$

Find Work done by a Person
to put hanging part on table.

EDUNITI

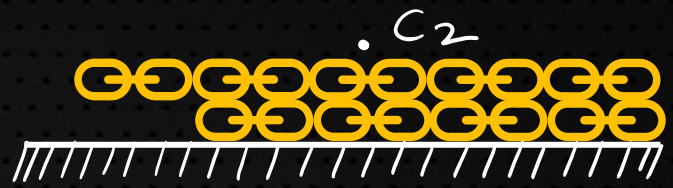
Case 2B



Chain mass and Length is m and L.

$x = 2L/3$

Find Work done by a Person to put hanging part on table.



Reference $U = 0$

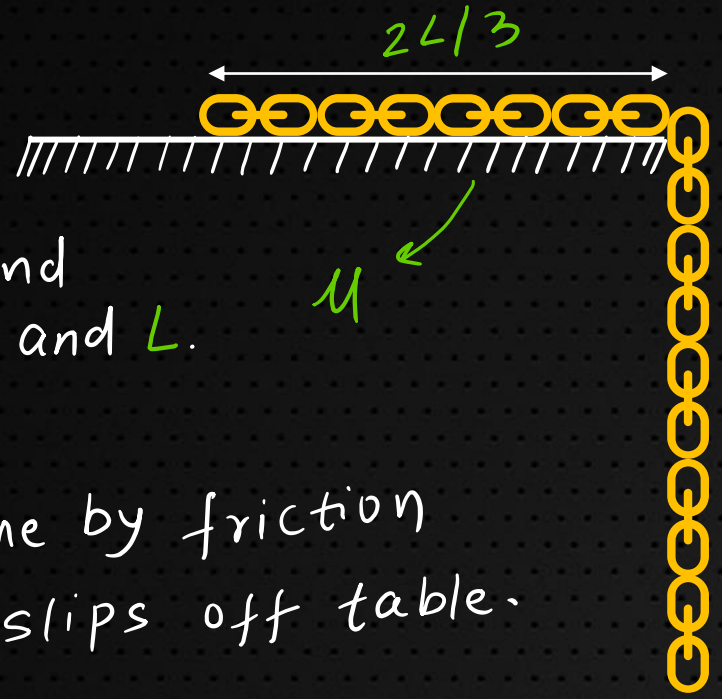
$\therefore W_{ext} = \Delta U = U_f - U_i$

$\Rightarrow W_{ext} = 0 - \left(-\frac{m}{3} \times g \times \frac{L}{6}\right)$

$= \frac{mgL}{18}$

Eduniti for Physics

Case 2C



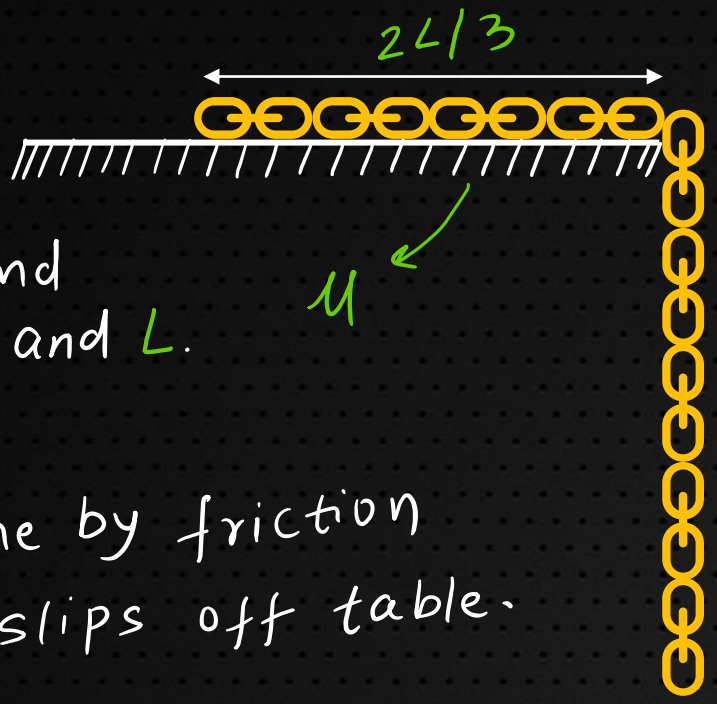
Chain mass and Length is m and L.

$x = 2L/3$

Find Work done by friction while chain slips off table.

EDUNITI

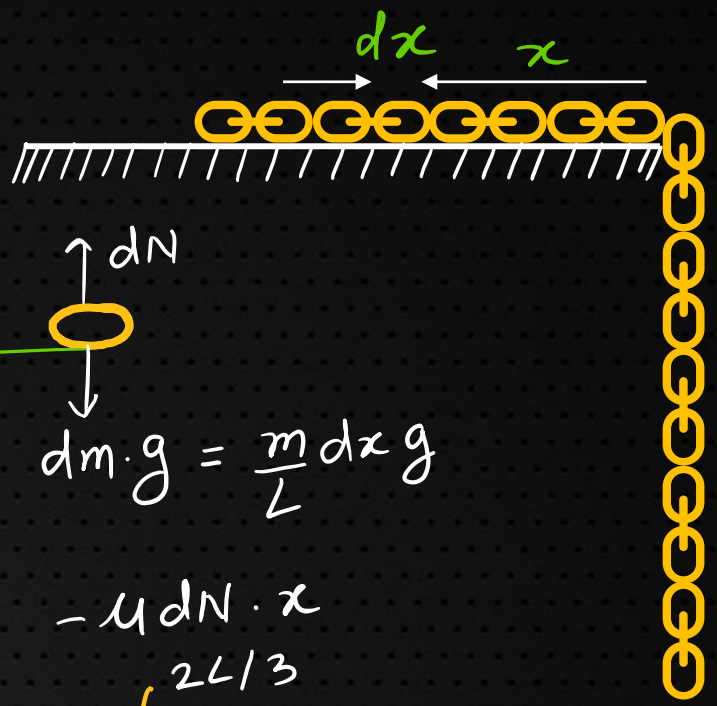
Case 2C



Chain mass and Length is m and L.

$x = 2L/3$

Find Work done by friction while chain slips off table.



$$dW_f = -u\,dN \cdot x$$

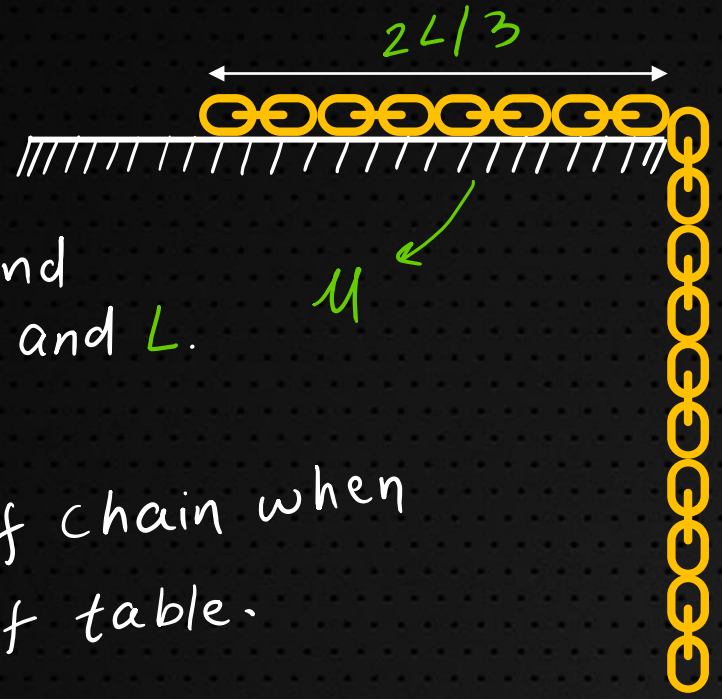
$$\Rightarrow W_f = -\int_0^{2L/3} u \times \frac{m}{L}\,dx \cdot g \cdot x$$

$$\Rightarrow W_f = -\frac{umg}{L}\left(\frac{x^2}{2}\right)_0^{2L/3}$$

$$= \boxed{-\frac{2}{9}umgL}$$

Eduniti for Physics

Case 2D

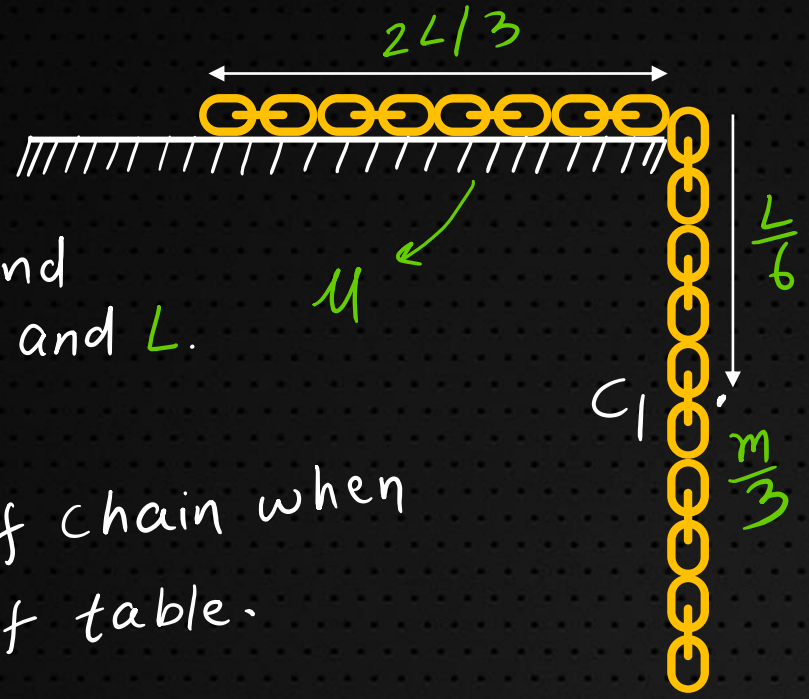


Chain mass and Length is m and L.

$x = 2L/3$

Find speed of chain when it slips off table.

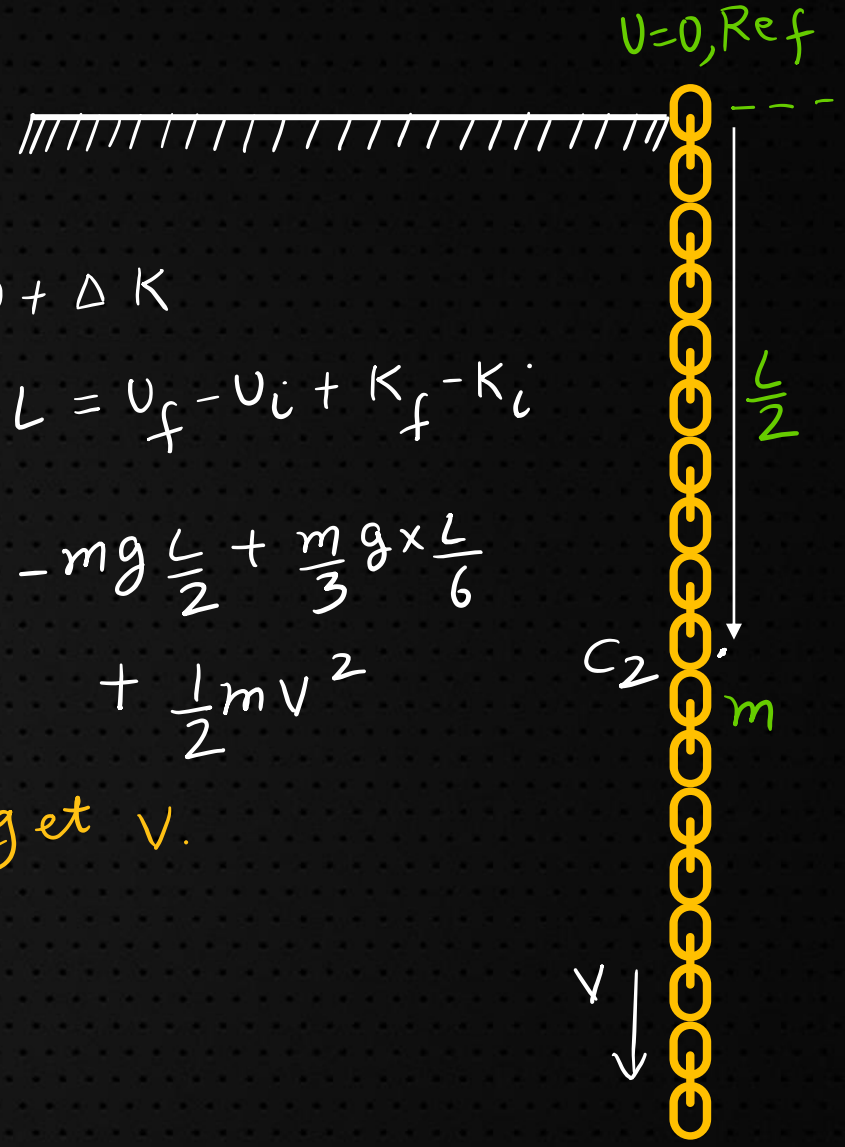
Case 2D



Chain mass and Length is m and L.

$x = 2L/3$

Find speed of chain when it slips off table.



$$W_f = \Delta U + \Delta K$$

$$\Rightarrow -\frac{2}{9}\mu mgL = U_f - U_i + K_f - K_i$$

$$\Rightarrow -\frac{2}{9}\mu mgL = -mg\frac{L}{2} + \frac{m}{3}g \times \frac{L}{6} + \frac{1}{2}mV^2$$

Solve to get V.

- PYQs (2020, 2021)
- Concept Videos
- Advanced Problems
- Part and Full Test

CLICK HERE

GOLD Mine Link -

https://bit.ly/2VhOGFF