YAKEEN NEET 2.0

2026

Basic Maths and Calculus (Mathematical Tools)

PHYSICS

Lecture - 13

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Todays Goal

- Revision
- Binomial
- Graph

Binomial Expansion

(Not imp)

$$(1+x)^n = 1 + nx + \frac{n.(n-1)\,x^2}{1\times 2} + \frac{n.(n-1)(n-2)\,x^3}{1\times 2\times 3} + \cdots$$

If $x << 1$

$$(1+x)^n \approx 1+nx$$

$$(1+x)^n \approx 1+nx \quad (\text{when } x << 1)$$

① $(1.001)^3 = (1+.001)^3 \simeq 1+3\times(.001) = \underline{1.003}$

② $(1.01)^5 = (1+.01)^5 \simeq 1+5\times(.01) = 1.05$

③ $(1.02)^3 = (1+.02)^3 \simeq 1+3\times(.02) = 1.06$

④ $(1.004)^3 \simeq 1.012$

..

⑤ $\sqrt{(1.006)} = (1+.006)^{\frac{1}{2}} = 1 + \frac{1}{2} \times .006 = 1.003$

⑥ $(1.004)^{-2} = (1+.004)^{-2} = 1 + (-2)(.004) = 1 - .008$
$= .992$

⑦ $(1.009)^{-\frac{1}{3}} = (1+.009)^{-\frac{1}{3}} = 1 - \frac{1}{3} \times .009 = 1 - .003$
$= .997$

(9) $(1.006)^{\frac{1}{6}} = 1 + \frac{1}{6}(.006) = 1.001$

(10) $(1.003)^{-2} = 1 + (-2)(.003)$
$= .994$

(11) $\sqrt{1.002}$
$= (1 + .002)^{\frac{1}{2}}$
$= 1.001$

(12) $\frac{1}{\sqrt{1.002}} = (1 + .002)^{-\frac{1}{2}}$
$= 1 + (-\frac{1}{2} \times .002)$
$= .999$

(13) $\frac{1}{1.001} = (1.001)^{-1} = 1 + (-1)(.001) = .999$

(14) $(1 + .02)^2 = 1.04$

(15) $(1 + .03)^3 = 1.09$

(16) $(1 + 1)^3 = 8$

If $x << 1$

$$(1+x)^n \approx 1+nx$$

$$(1-x)^n \approx 1-nx$$

$$(1+x)^{-n} \approx 1-nx$$

$$(1-x)^{-n} \approx 1+nx$$

$\sqrt{.998} = (.998)^{\frac{1}{2}} = (1-.002)^{\frac{1}{2}} = 1 - \frac{1}{2} \times (.002)$

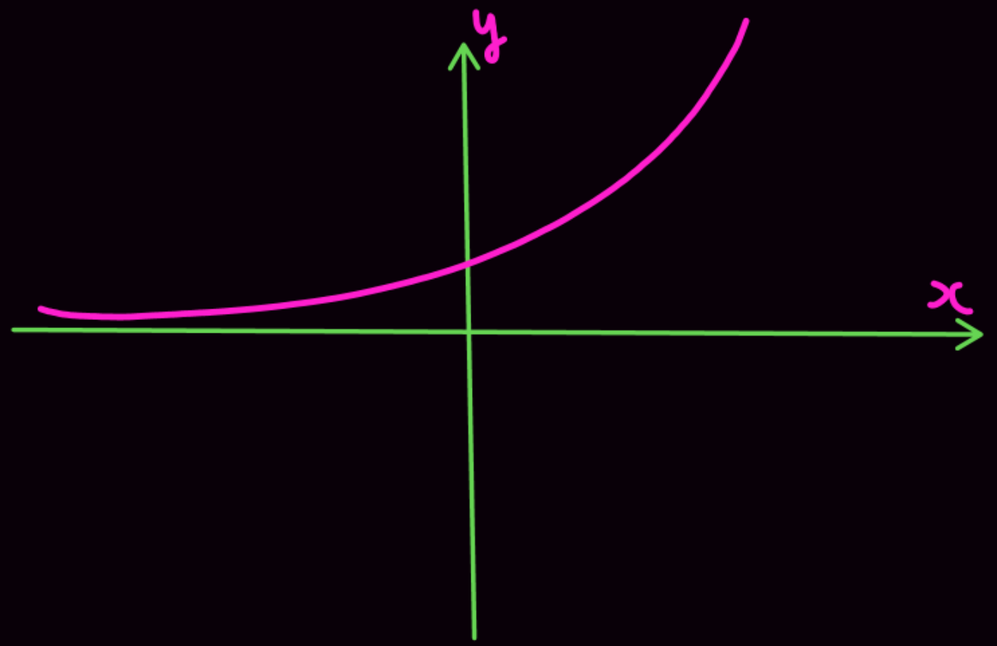
$= .999$.

$\frac{1}{\sqrt{.998}} = (.998)^{-\frac{1}{2}} = (1-.002)^{-\frac{1}{2}} = 1 - \left(-\frac{1}{2} \times .002\right)$

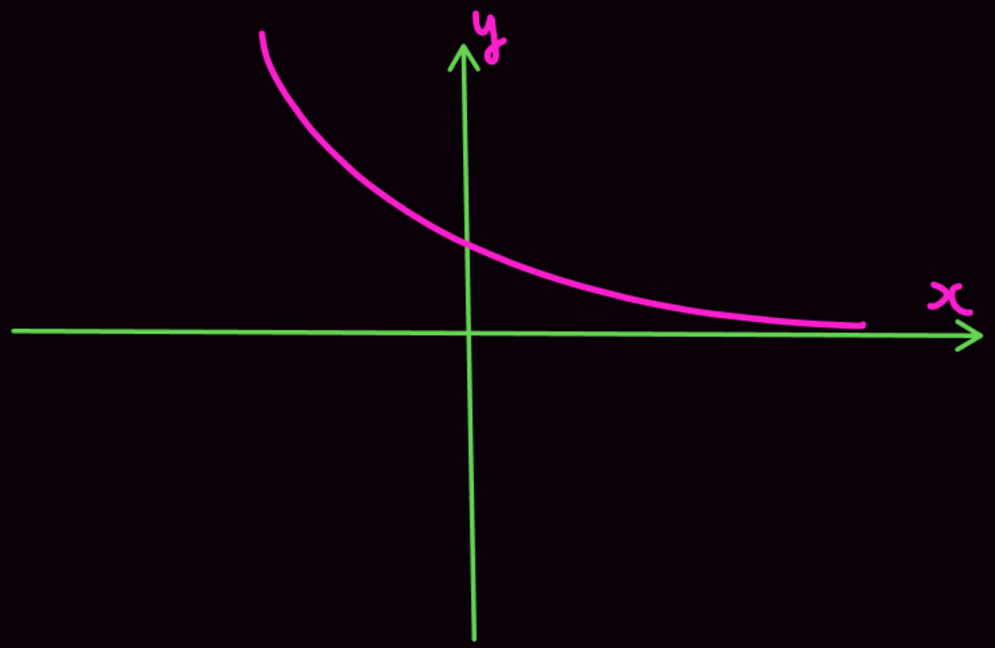
$= 1 + .001 = 1.001$

Graph

① $y = e^x$

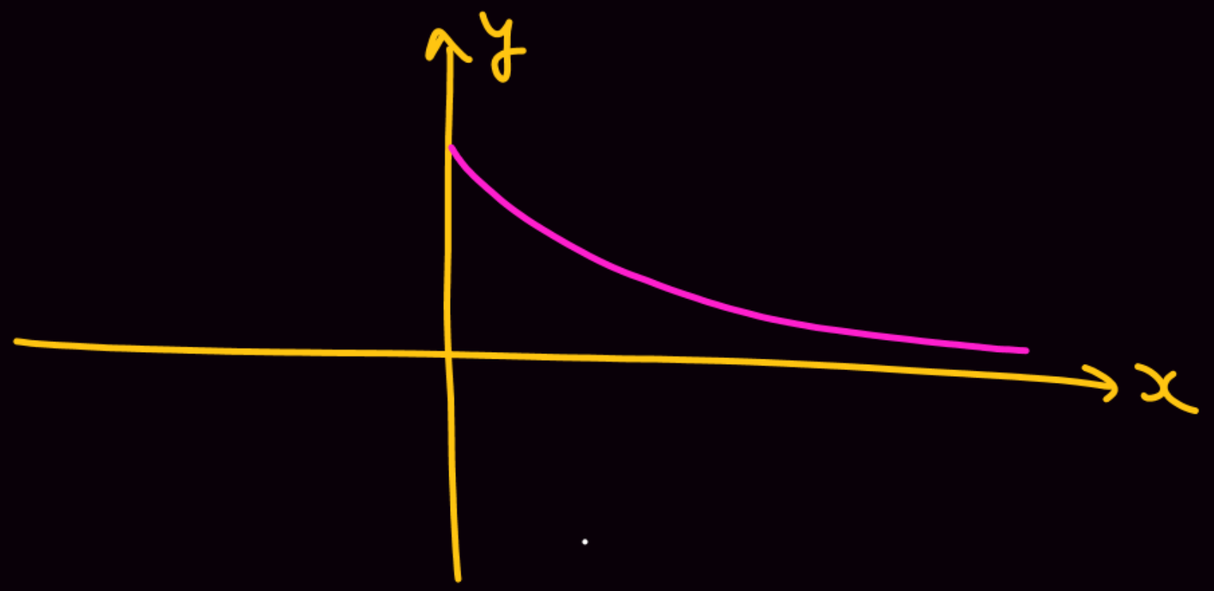


② $y = e^{-x}$

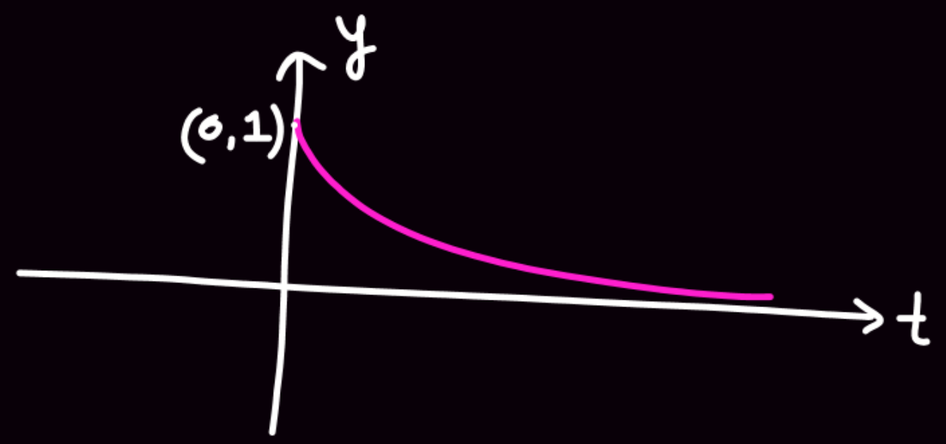


Physics में Jo Kaam Aayega

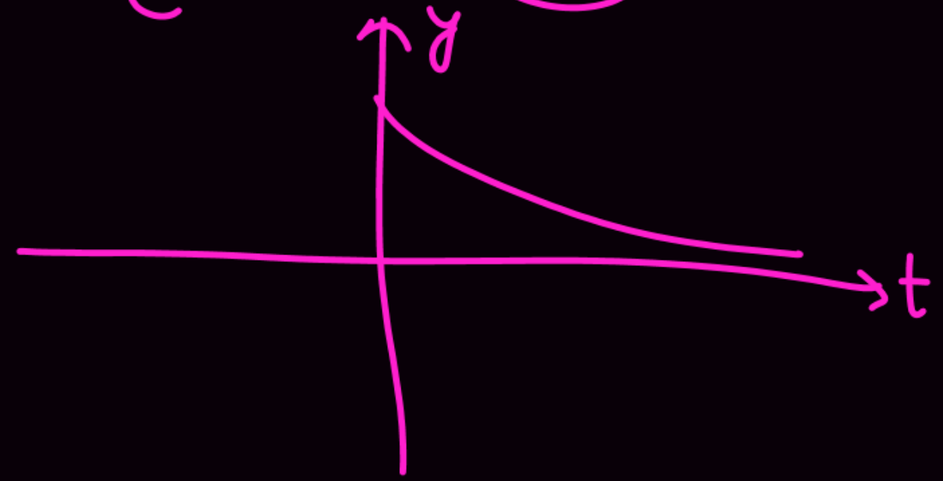
$y = e^{-x}$ $(\text{for } x \geq 0)$



① $y = e^{-t}$

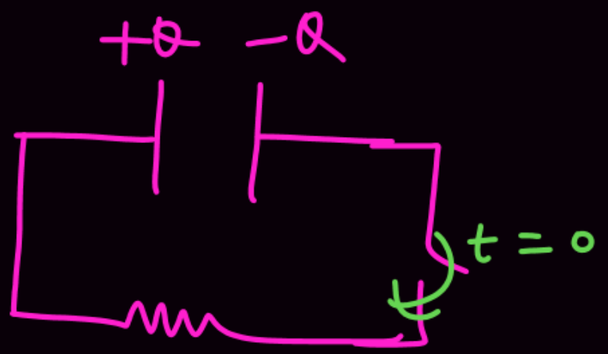


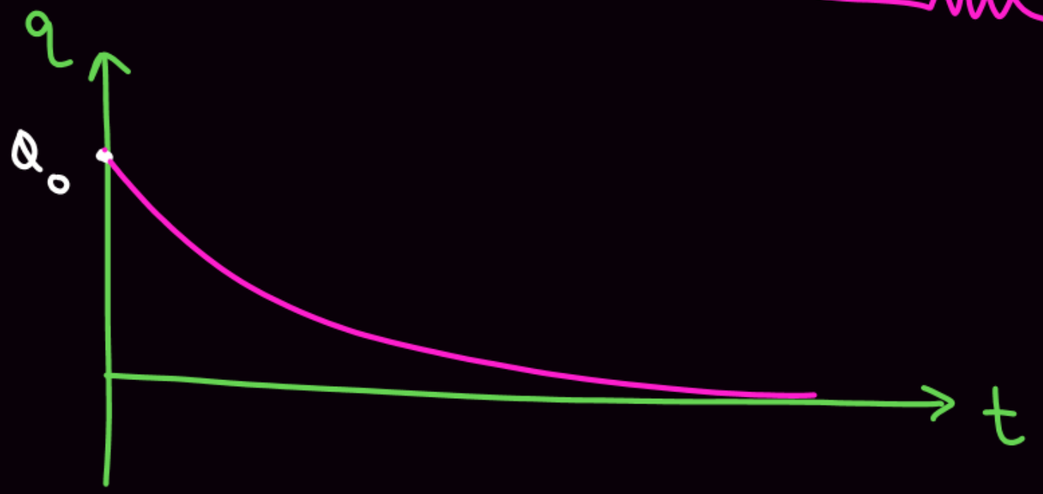
② $y = e^{-kt}$ $(k>0)$



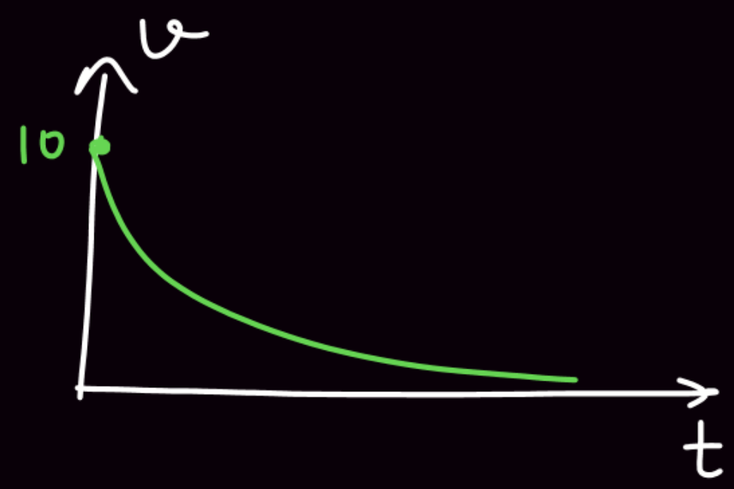
Q discharging of capacitor

$q = Q_0 e^{-t/\tau}$





Q $v = 10 e^{-2t}$



$t = 0, \quad q_{in} = Q_0(1 - e^0) = 0$

$t \to \infty$

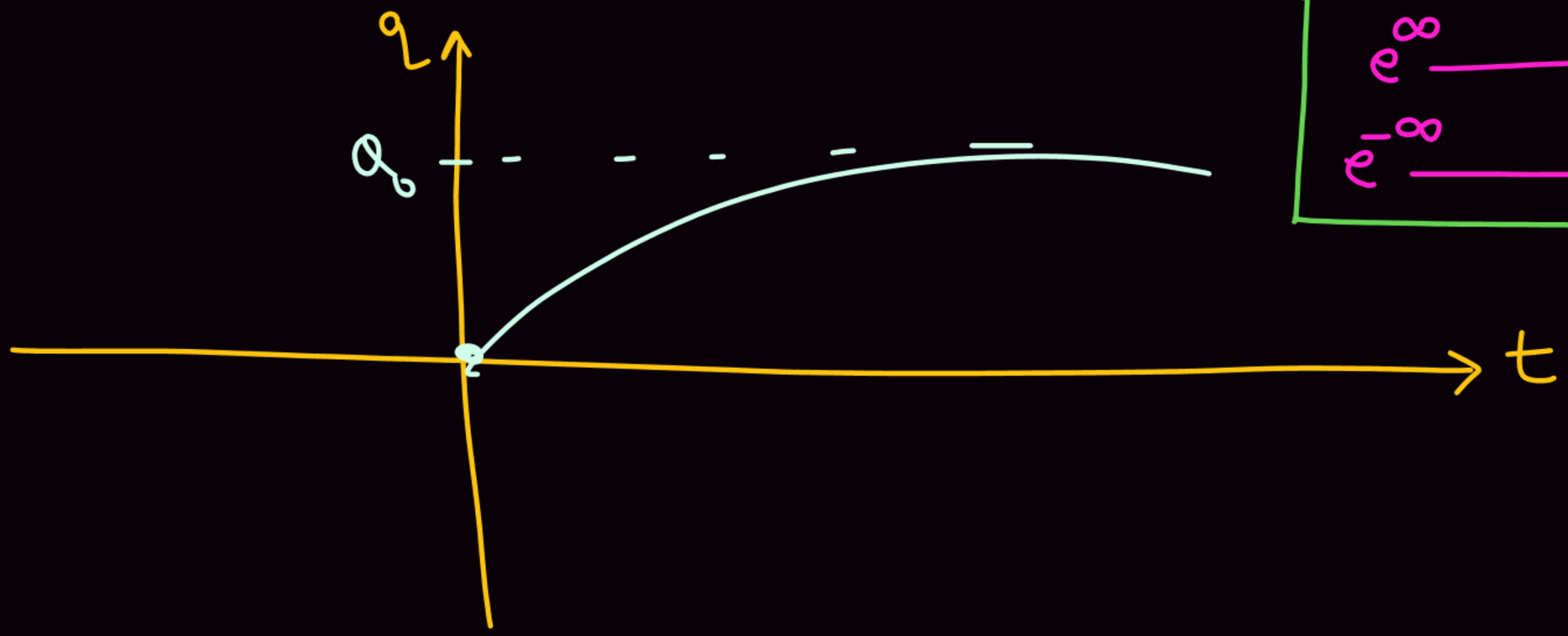
$q_f = Q_0(1 - e^{-\infty})$

$= Q_0(1 - 0)$

$= Q_0$

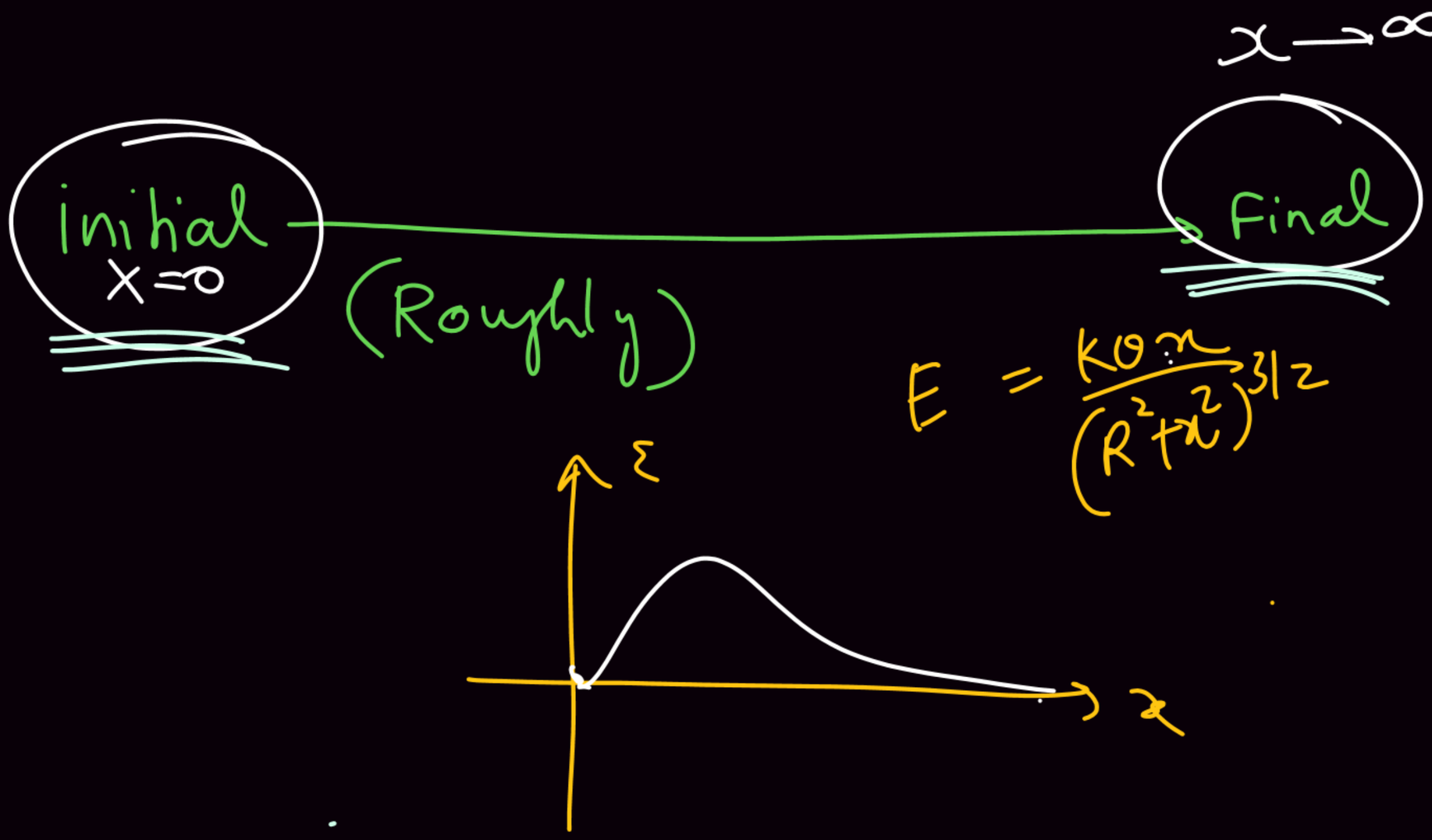
$t > 0$ → इंक्लनाई

Q $\quad q = Q_0(1 - e^{-t/\tau})$

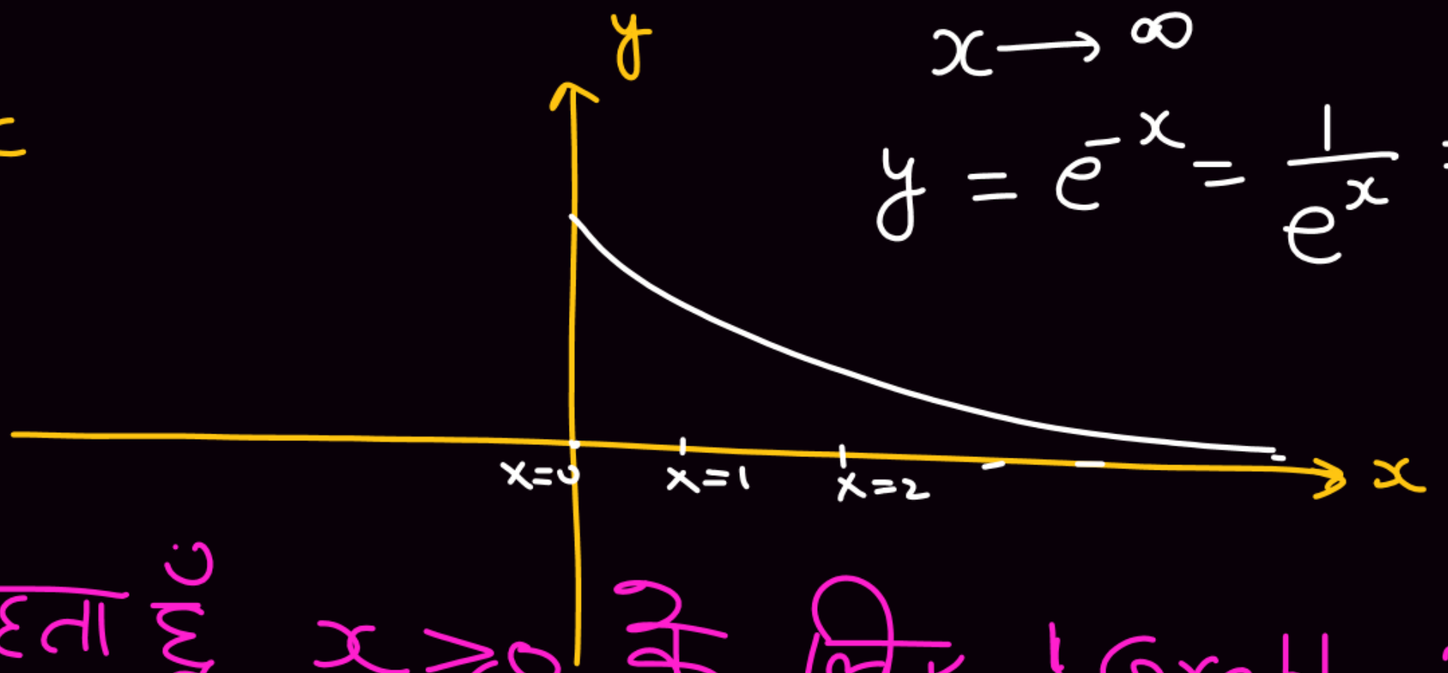


$e^{\infty} \longrightarrow \infty$

$e^{-\infty} \longrightarrow 0$


x → ∞
Initial
x = 0
Final
(Roughly)
E = kQx / (R² + x²)^3/2
E
x

$y = e^{-x}$



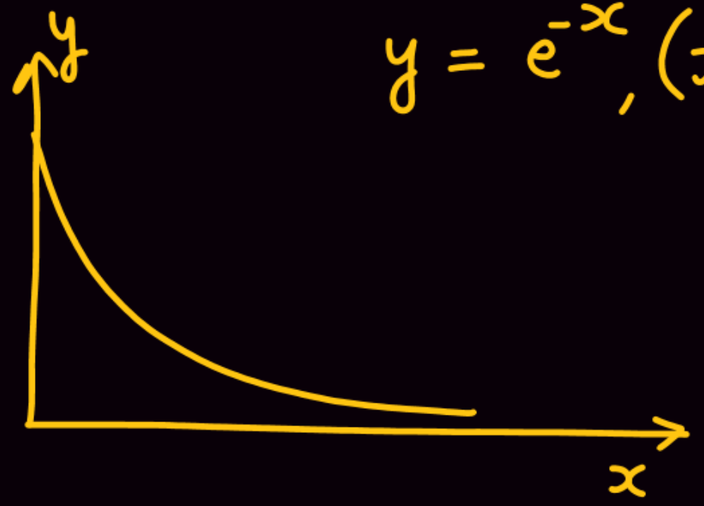
$x \to \infty$

$y = e^{-x} = \frac{1}{e^x} = \frac{1}{e^{\infty}} = \frac{1}{\infty}$

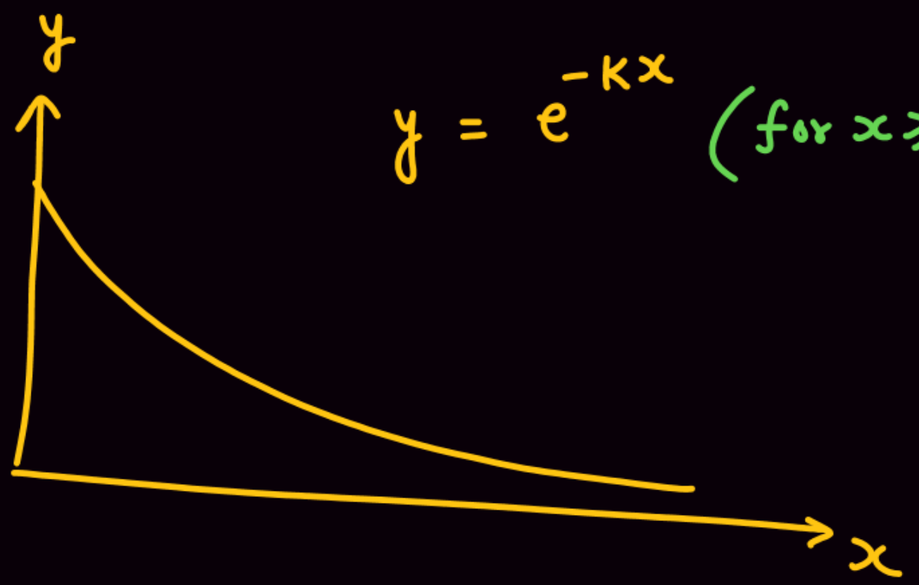
$y \to 0$

मैं चाहता हूँ $x \geq 0$ के लिए Graph Draw करें

But काम का Graph



$y = e^{-x}$, (for $x \geq 0$)



$y = e^{-kx}$ (for $x \geq 0$)

Physics में use

Q $y = x^3 - 3x^2 + 6$

Find y_{max} & y_{min}

Q $x = t^3 - 3t^2 + 6$

9 $v = 6t^2 - 6t^3$

find v_{max}

Q $x = 5t^2 - 9t + 3$

find x_{max} , also plot graph

Q $y = \sin\theta + \sqrt{3}\cos\theta$

$y_{max} = ?$

Q $y = x^2 - 4x + 10$

$y_{min} = ?$

THANK YOU