YAKEEN NEET 2.0

2026

Basic Maths and Calculus (Mathematical Tools)

PHYSICS

Lecture - 09

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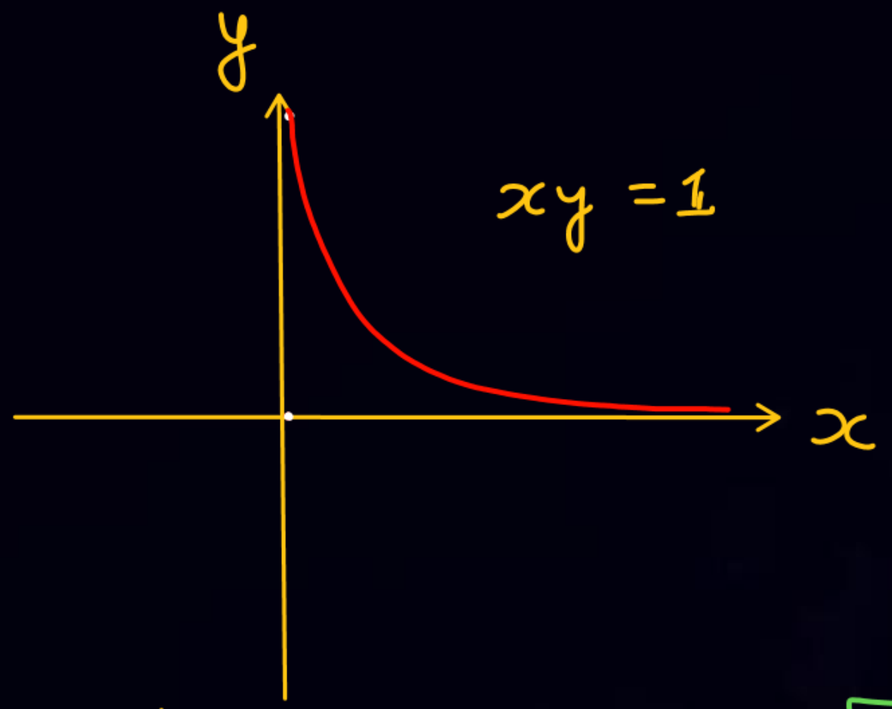
Topics to be covered

1. Graphs
2.
3.
4. [redacted]

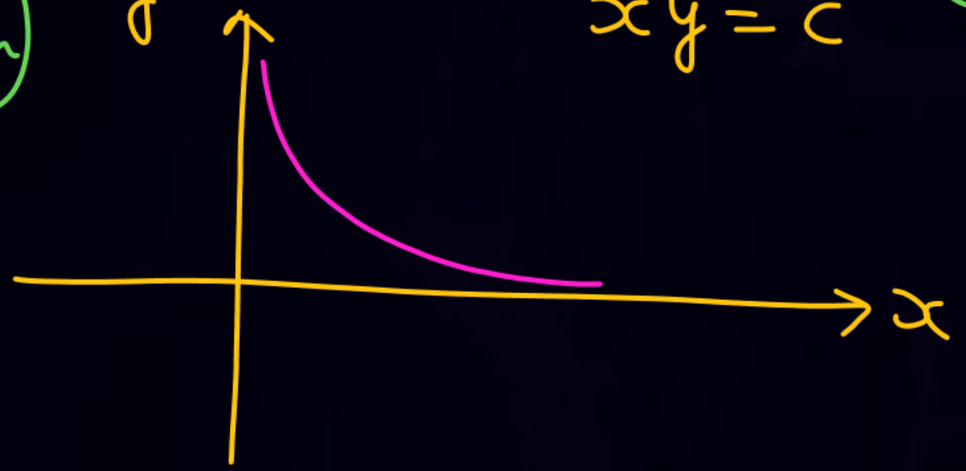
$xy = 1$

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



$xy = 4$

$xy = c$ → (+ve number)



$xy = c$ → (+ve const)

Q $PV = nRT$

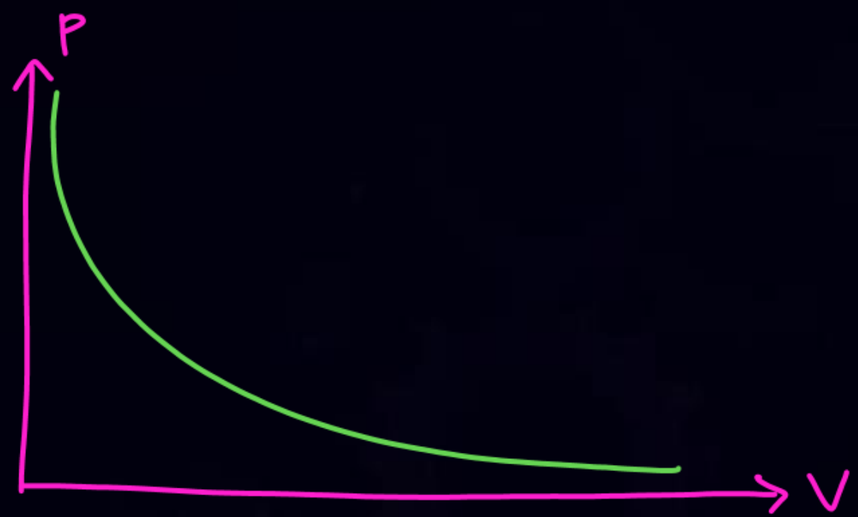
if $n \longrightarrow$ Const

$T \longrightarrow$ Const (Isothermal)

Draw 'P' Vs 'V' Graph

Sol^n

$PV = nRT$



$xy = \text{Const}$

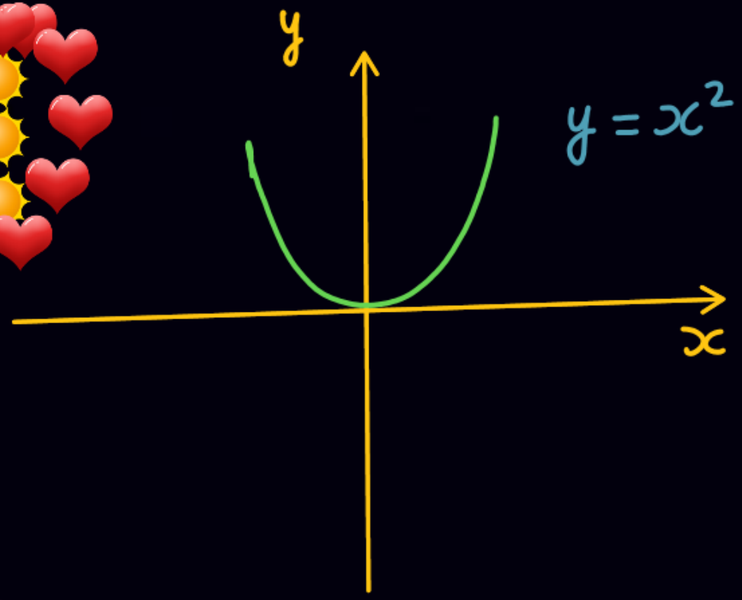
$PV = \text{const}$

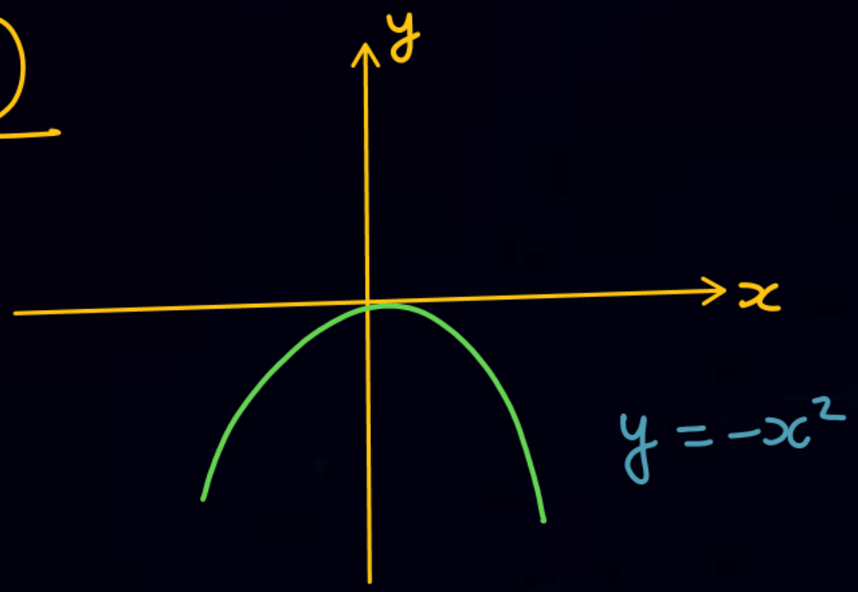
If $V \uparrow \Rightarrow P \downarrow$

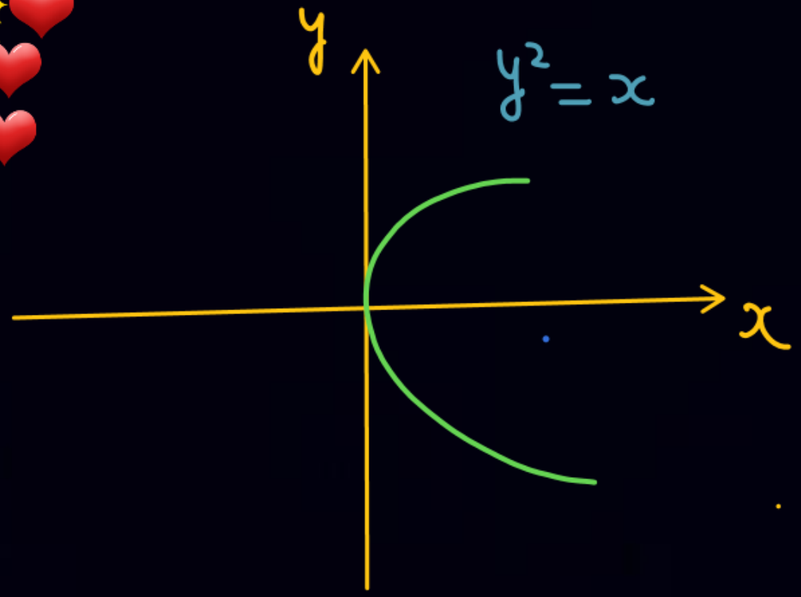
$V \downarrow \Rightarrow P \uparrow$

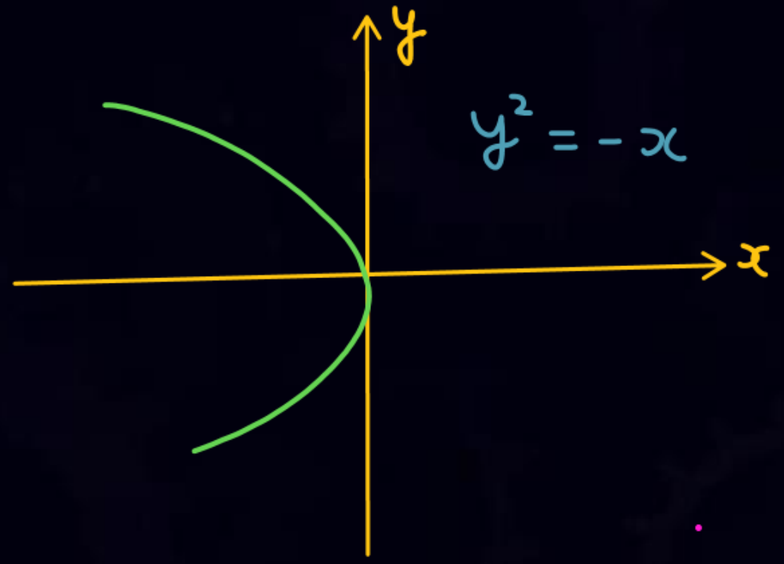
$P = \frac{\text{Const}}{\text{Volm}}$

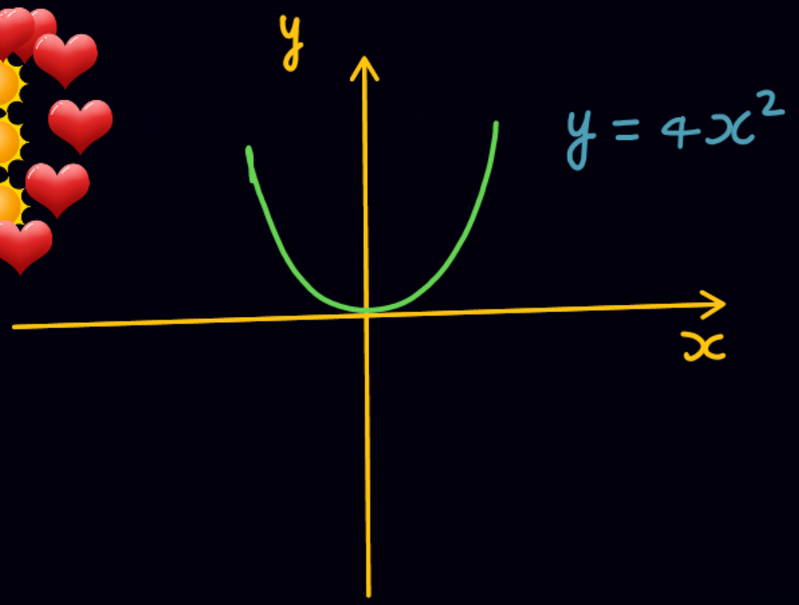
(Parabola)

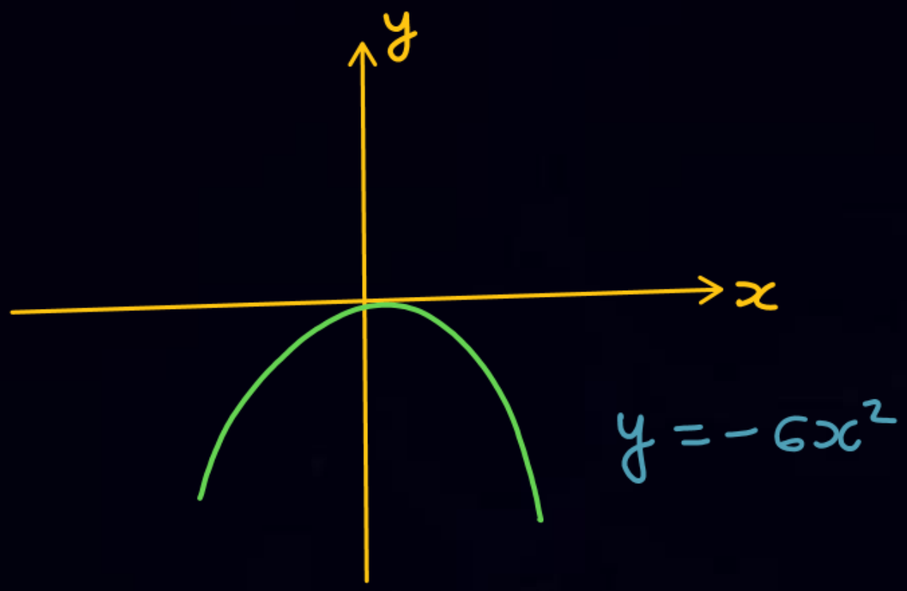


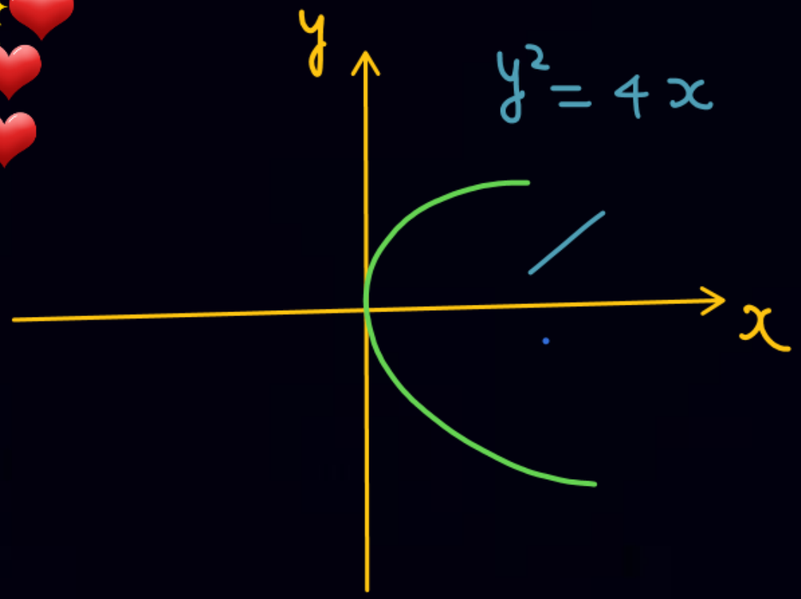


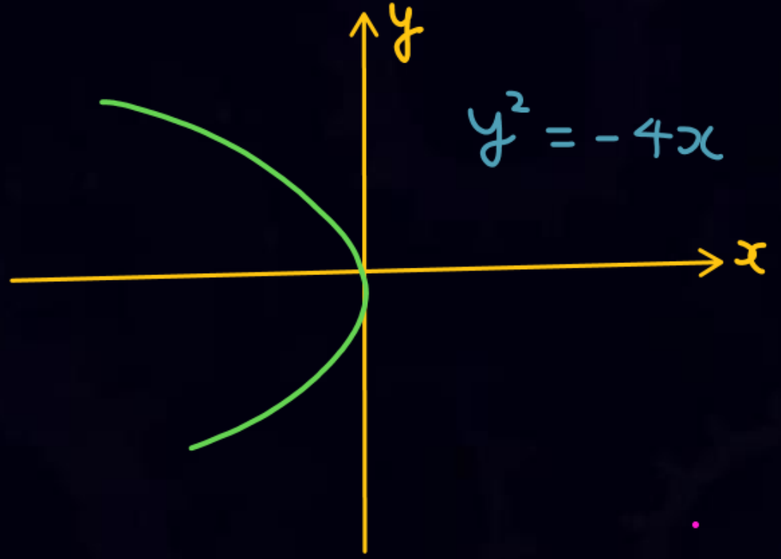





y
x
$y = 4x^2$


y
x
$y = -6x^2$

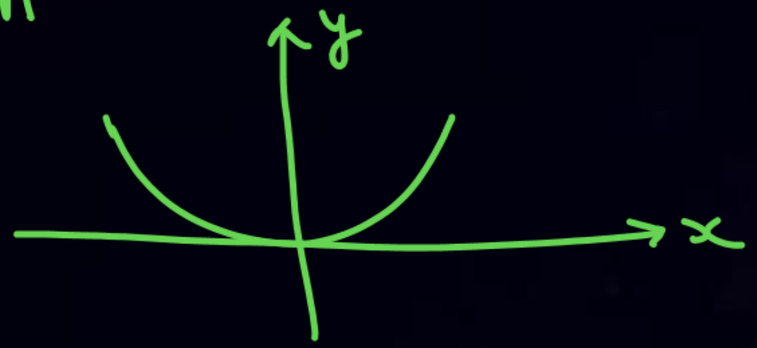

y
x
$y^2 = 4x$

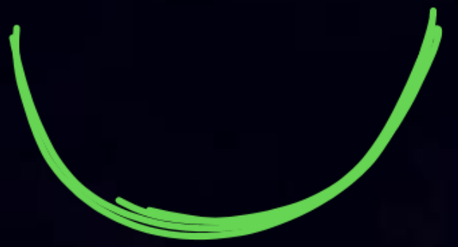

y
x
$y^2 = -4x$

SKC

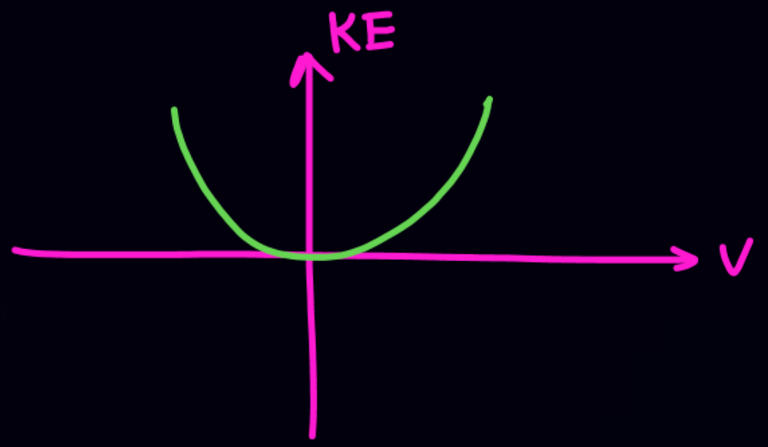
$y = x^2$, एक सीधा कटोरा

खुला





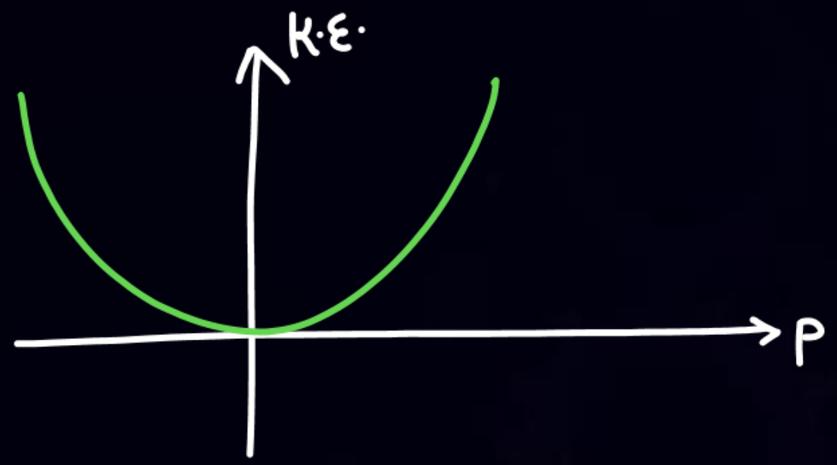
$KE = \frac{1}{2}mv^2$ (const)



$y = \frac{1}{2}mx^2$

$y = \left(\frac{m}{2}\right)x^2$

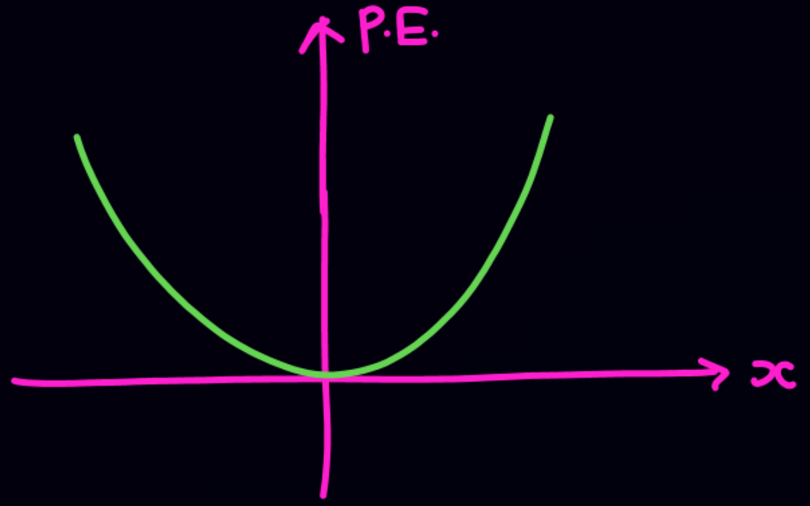
$K.E. = \frac{P^2}{2m}$ $P \rightarrow$ momentum



Q

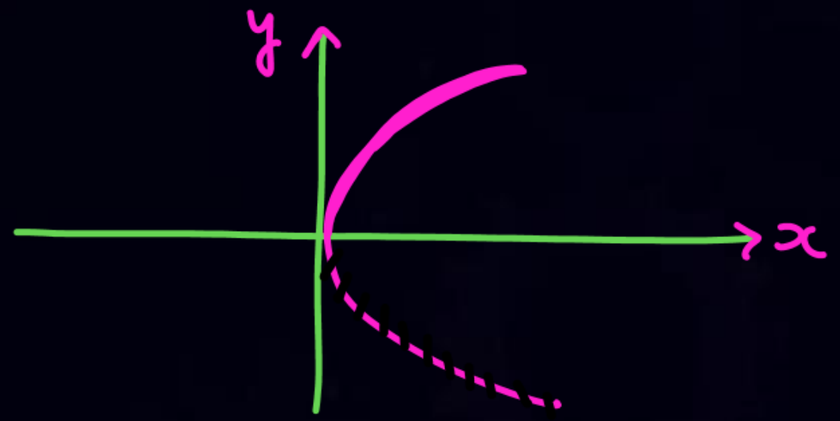
SHM

$P.E. = \frac{1}{2} K x^2$ → Const



Q $y = \sqrt{x}$ ($y > 0$ हमेशा)

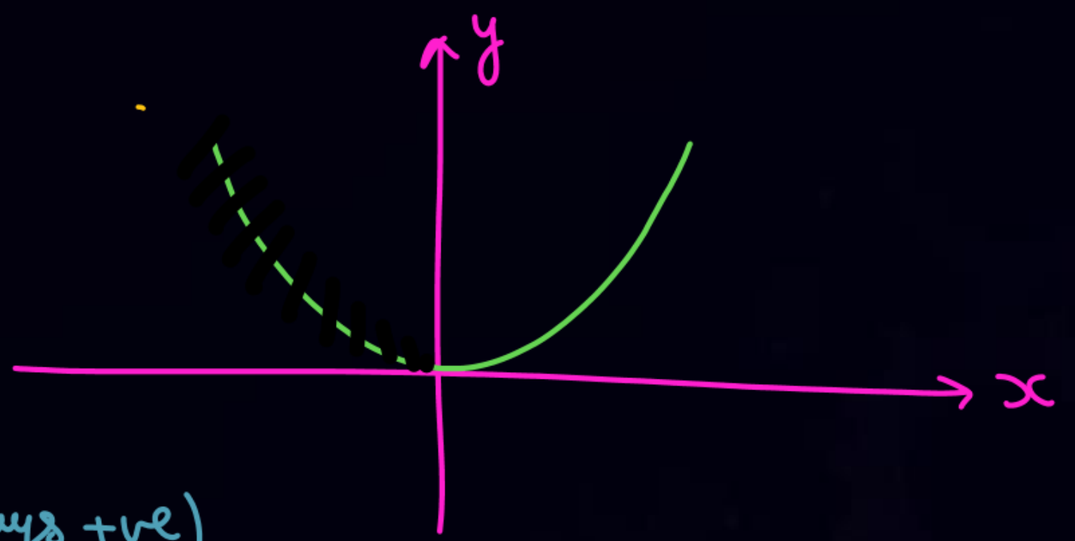
$y^2 = x$



Q $x = \sqrt{y}$

Square $x^2 = y$

$\boxed{y = x^2}$



($x = \sqrt{y}$ में, x always +ve)

GP ⇒ Geometric Progression

General Form ⇒ $a, \quad ar, \quad ar^2, \quad ar^3, \quad \ldots$

First term = a

r = Common Ratio.

काम की बातें

- For $|r| < 1$
- Sum of ∞ terms $S_n = \frac{a}{1-r}$

not imp

$$n^{th} \text{ term} = ar^{n-1}$$

$$\text{Sum of } n^{th} \text{ term} \Rightarrow S_n = \frac{a(1-r^n)}{1-r}$$

$2^{10} \rightarrow 1024$

$2^{20} \rightarrow 1048576$

$2^{30} \rightarrow 1073741824$

$2^{50} \rightarrow 1125899906842624$

Q Find $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots\cdots \infty$

Soln $a = 1$

$$r = \frac{1/2}{1} = \frac{1}{2}$$

$$S_\infty = \frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = \frac{1}{\left(\frac{1}{2}\right)} = 2$$

Q Find $1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{32} + \cdots\cdots\infty$

Soln $a = 1$

$$r = \frac{1/4}{1} = \frac{1}{4}$$

$$S_\infty = \frac{a}{1-r} = \frac{1}{1-\frac{1}{4}} = \frac{1}{\frac{3}{4}} = \frac{4}{3}$$

Q Find $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \cdots \infty$

Sol^n $a = 1$

$$r = \frac{-1/2}{1} = -\frac{1}{2}$$

$$\frac{-\frac{1}{32}}{\frac{1}{16}} = -\frac{1}{32} \times \frac{16}{1} = -\frac{1}{2}$$

$$S_\infty = \frac{a}{1-r} = \frac{1}{1-\left(-\frac{1}{2}\right)} = \frac{1}{1+\frac{1}{2}} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

Q If $F_{net} = \frac{KQq}{r^2} + \frac{KQq}{2r^2} + \frac{KQq}{4r^2} + \cdots$ up to ∞

Find value of F_{net}

Sol^n $$F_{net} = \frac{KQq}{r^2} + \frac{KQq}{2r^2} + \frac{KQq}{4r^2} + \cdots \infty$$

$$F_{net} = \frac{KQq}{r^2}\left[1 + \frac{1}{2} + \frac{1}{4} + \cdots \infty\right]$$

$$F_{net} = \frac{KQq}{r^2}[2] = \frac{2KQq}{r^2}$$

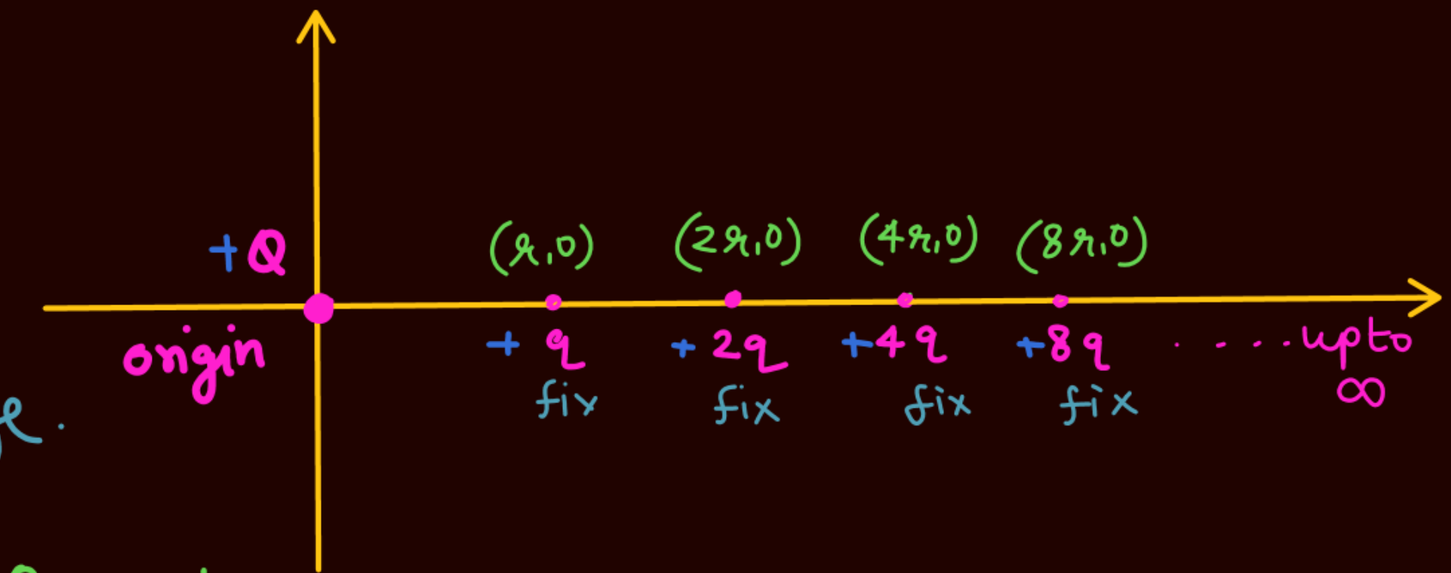
$$S_\infty = \frac{a}{1-r}$$

$$= \frac{1}{1-\frac{1}{2}}$$

$$= 2$$

Q

Find magnitude of net force on +Q charge at origin due to all the charge.



Sol^n

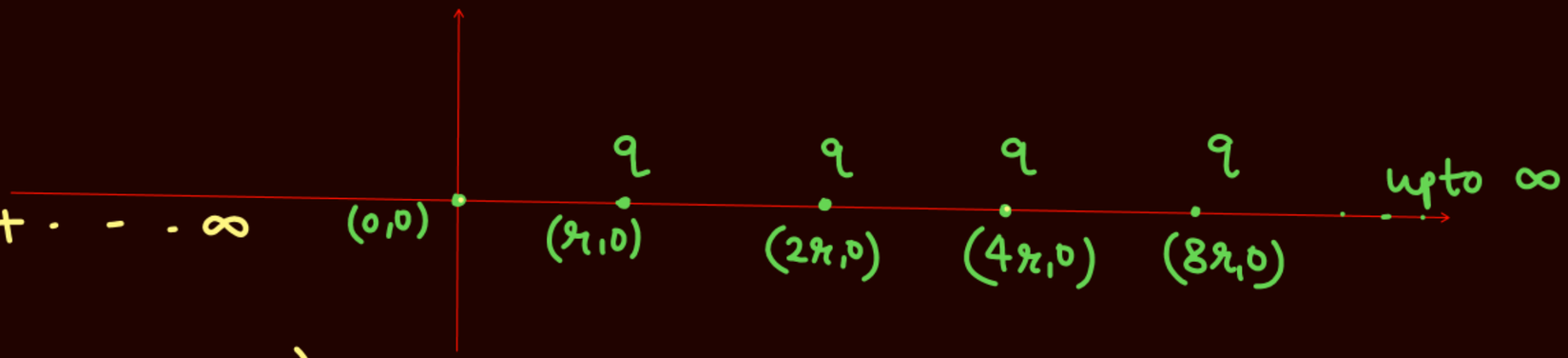
$$F_{net} = \frac{KQq}{r^2} + \frac{K\,2q\cdot Q}{(2r)^2} + \frac{K\,4q\cdot Q}{(4r)^2} + \text{- - -}$$

$$= \frac{KQq}{r^2} + \frac{KQq}{2r^2} + \frac{KQq}{4r^2} + \text{. - - .}$$

$$= \frac{KQq}{r^2}\left(1 + \frac{1}{2} + \frac{1}{4} + \text{- -}\right) = \frac{KQq}{r^2} \times 2$$

Q If electric potential due to a point charge q at a distance r is given by $V = \frac{Kq}{r}$. find potential at origin

Sol^n



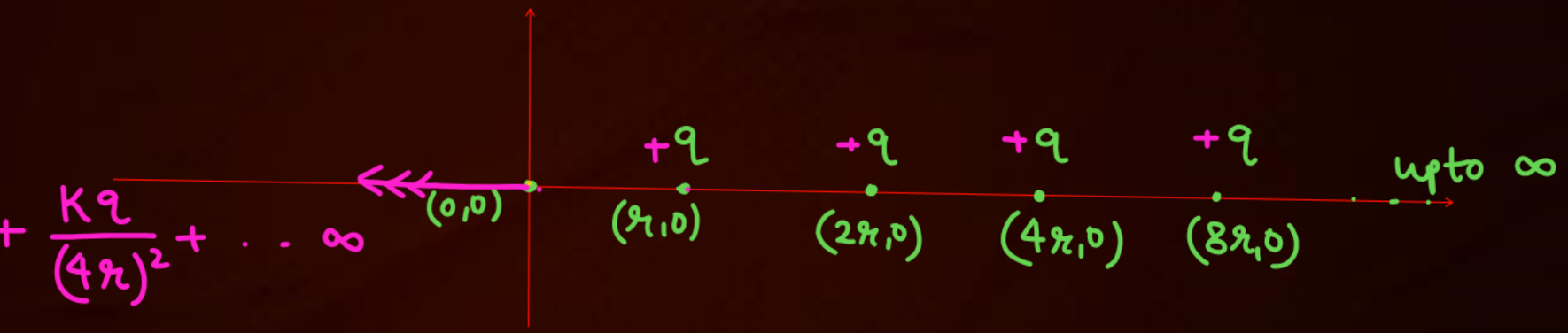
$$V_{origin} = \frac{Kq}{r} + \frac{Kq}{2r} + \frac{Kq}{4r} + \cdots \infty$$

$$= \frac{Kq}{r}\left(1 + \frac{1}{2} + \frac{1}{4} + \cdots \infty\right)$$

$$= \frac{2Kq}{r}$$

Q If electric Field due to a point charge q at a distance r is given by $E = \frac{Kq}{r^2}$. find potential at origin

Sol^n



$$E_{net} = \frac{Kq}{r^2} + \frac{Kq}{(2r)^2} + \frac{Kq}{(4r)^2} + \cdots \infty$$

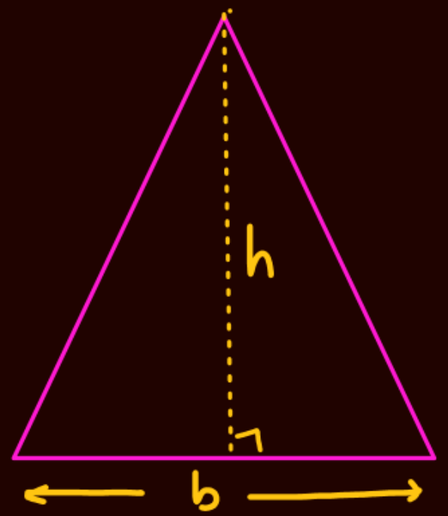
$$= \frac{Kq}{r^2} + \frac{Kq}{4r^2} + \frac{Kq}{16r^2} + \cdots \infty$$

$$= \frac{Kq}{r^2}\left[1 + \frac{1}{4} + \frac{1}{16} + \cdots \infty\right] = \frac{Kq}{r^2}\left[\frac{1}{1 - \frac{1}{4}}\right] = \frac{4}{3}\frac{Kq}{r^2}$$

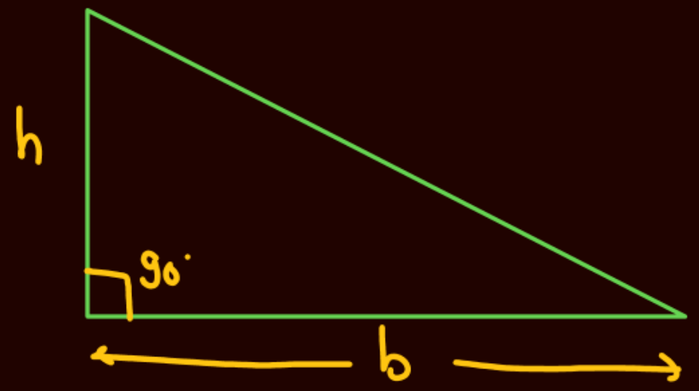
⇒ Area of triangle

$= \frac{1}{2}$(base × height)

$= \frac{1}{2}\, b.h.$

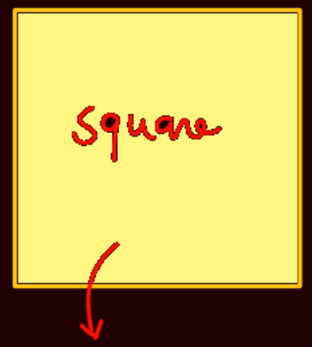


⇒ $\text{Area} = \frac{1}{2} \cdot b.h$

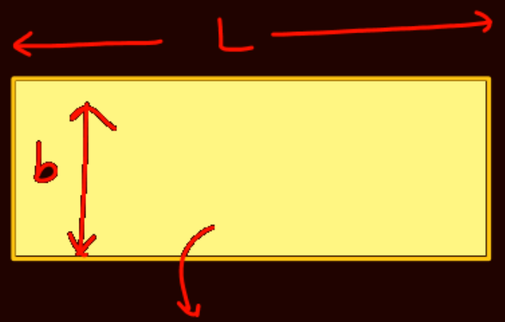


⇒ Area of Square (L) = L^2

⇒ Area of rectangle = L × b

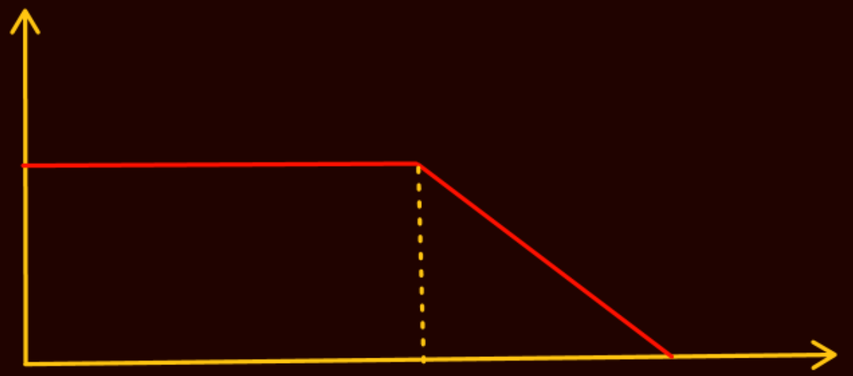


Area = L^2



Area = Lb

Area of trapizium = $\frac{1}{2}$ (Sum of the parallel side) × (Distance between parallel side)



Thank You