DAY 38

MCA CET 2025

MATHS

Straight Circle

PARABOLA

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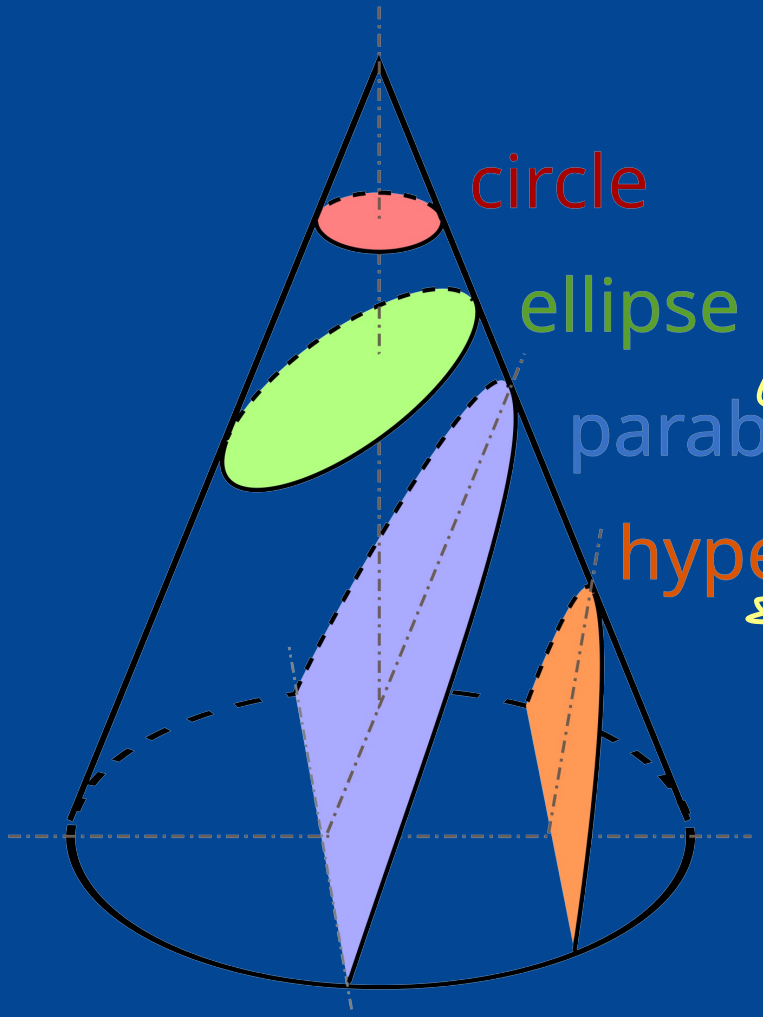
understanding Parabola



parallel to a side.

parallel to central axis

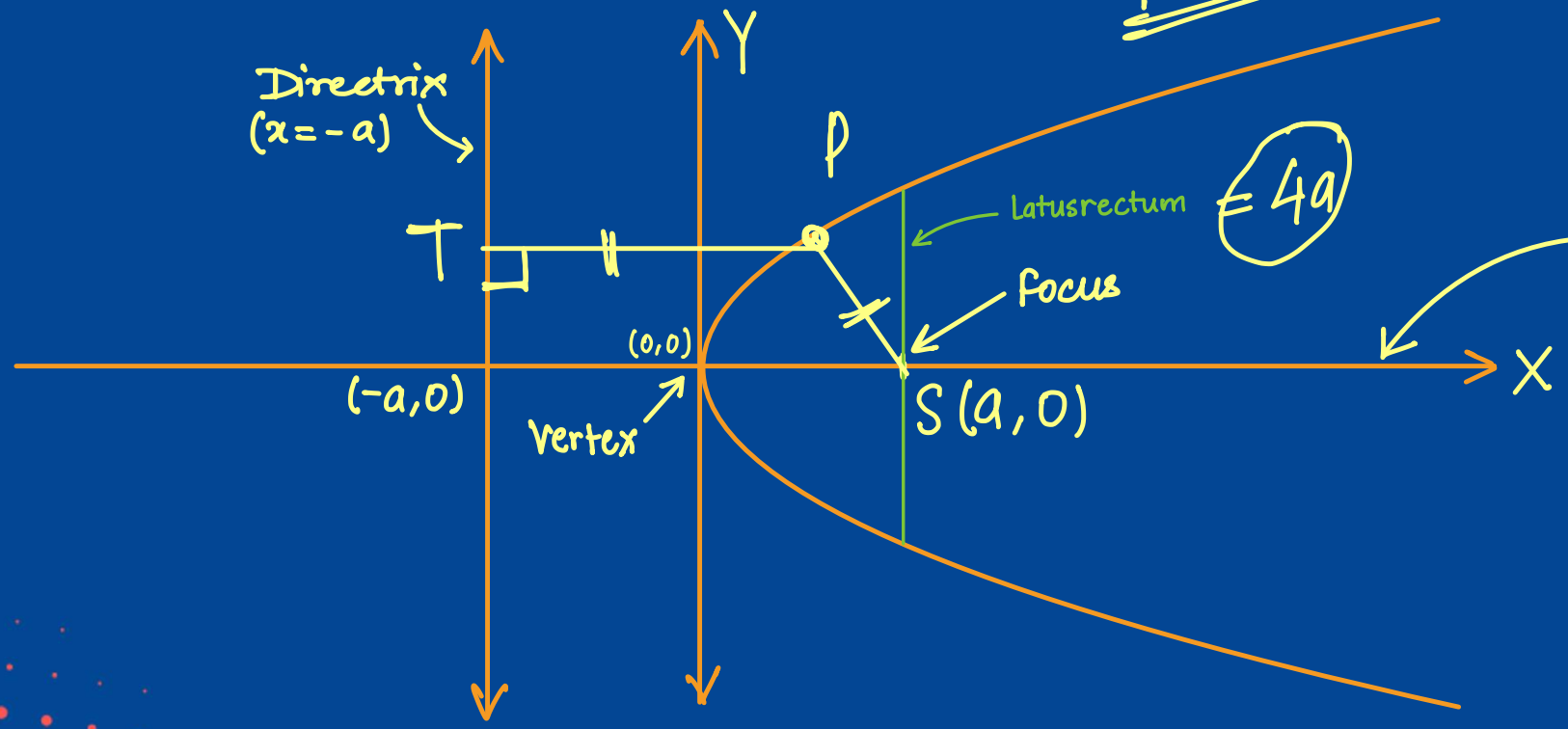
$e = 1$

understanding parts of Parabola

$SP = TP$

$y^2 = 4ax$

Standard equation of Parabola.



$\frac{SP}{PT} = 1 = e$

$e < 1 \Rightarrow$ ellipse

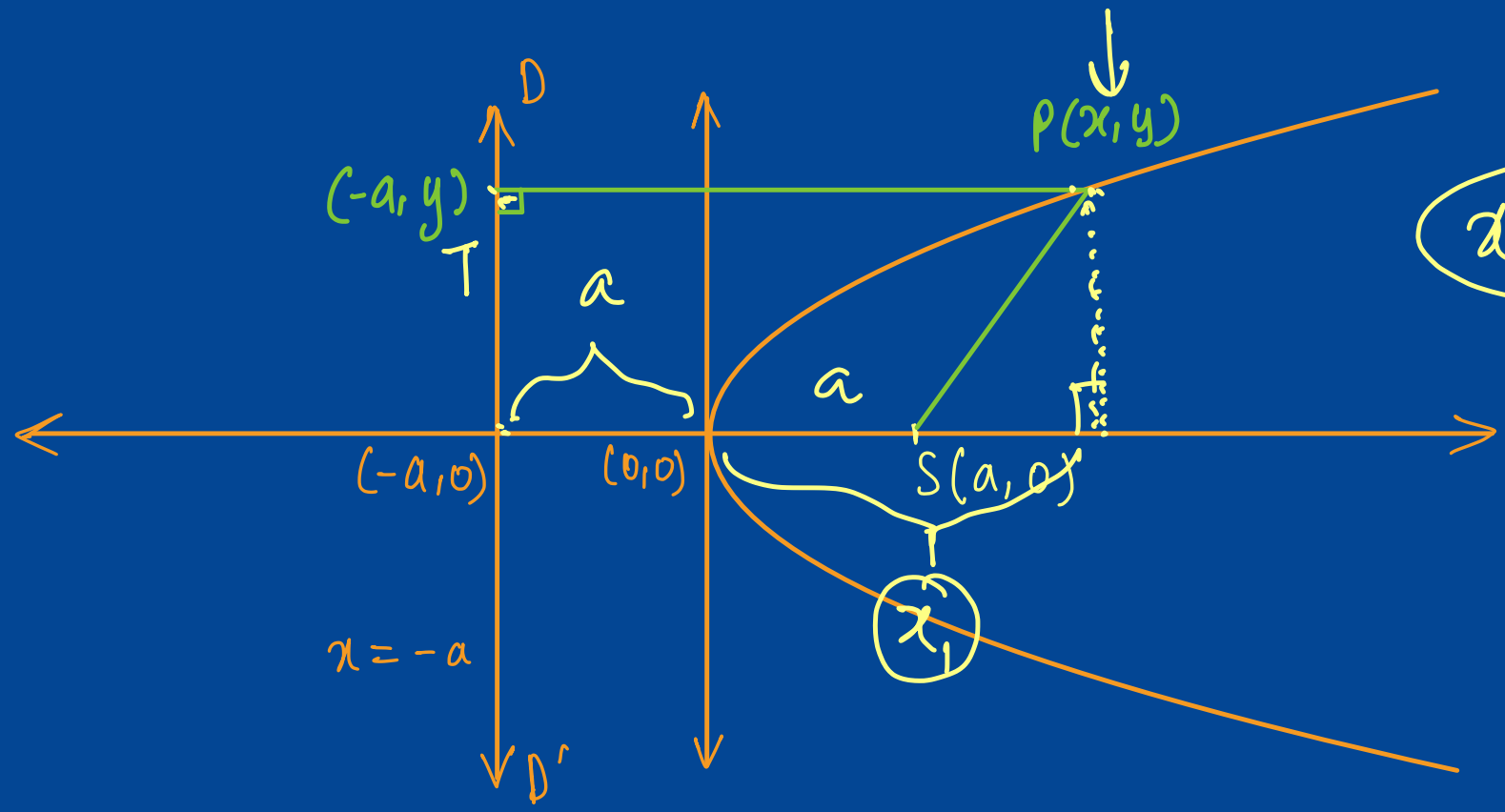
$e > 1 \Rightarrow$ hyperbola

Focal Distance

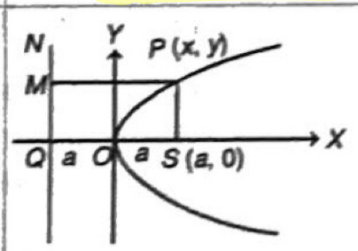
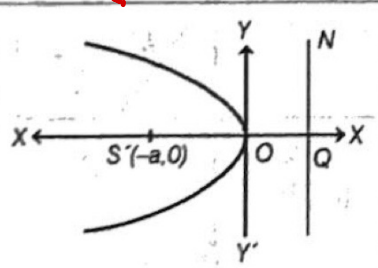
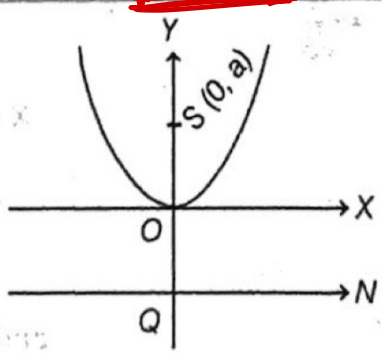
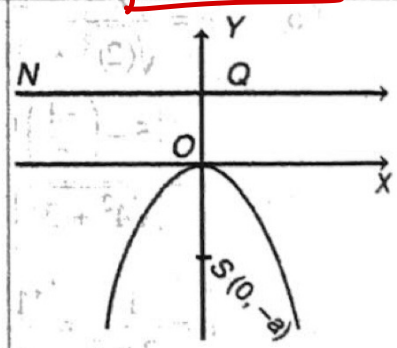
$SP = PT$

$y^2 = 4ax$

PT



$x_1 + a$

	Parabola →	1. $y^2 = 4ax$	2. $y^2 = -4ax$	3. $x^2 = 4ay$	4. $x^2 = -4ay$
	Figures →				
	Terms related to parabola ↓	$y^2 = 4ax$	$y^2 = -4ax$		
1.	Focus	$(a, 0)$	$(-a, 0)$	$(0, a)$	$(0, -a)$
2.	Directrix	$x = -a$	$x = a$	$y = -a$	$y = a$
3.	Vertex	$(0, 0)$	$(0, 0)$	$(0, 0)$	$(0, 0)$
4.	Axis	X-axis *i.e.*, $y = 0$	$y = 0$	Y-axis *i.e.*, $x = 0$	$x = 0$
5.	Length of latusrectum	$4a$	$4a$	$4a$	$4a$
6.	Equation of latusrectum	$x = a$	$x + a = 0$	$y = a$	$y + a = 0$
7.	Extremities of latusrectum	$(a, 2a)$ and $(a, -2a)$	$(-a, 2a)$ and $(-a, -2a)$	$(2a, a)$ and $(-2a, a)$	$(2a, -a)$ and $(-2a, -a)$
8.	Eccentricity	$e = 1$	$e = 1$	$e = 1$	$e = 1$
9.	Focal distance	$x + a$	$x - a$	$y + a$	$y - a$

General Equation of Parabola.

$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$$

$= 0$

$y^2 = 4ax$

vertex $= (0,0)$

vertex $= (h,k)$

$(y-k)^2 = 4a(x-h)$

if $abc + fgh - af^2 - bg^2 - ch^2 \neq 0$

and $ab - h^2 = 0$, $e = 1$

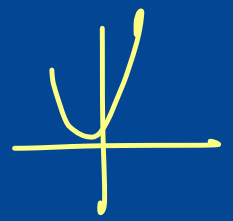
Equation of Parabola in parametric form

(t) → condition

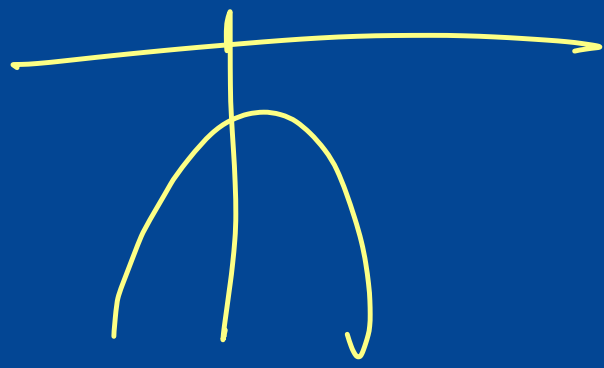
For $y^2 = 4ax \Rightarrow (at^2, 2at)$

$y^2 = -4ax \Rightarrow (-at^2, 2at)$

$x^2 = 4ay \Rightarrow (2at, at^2)$



$x^2 = -4ay \Rightarrow (2at, -at^2)$

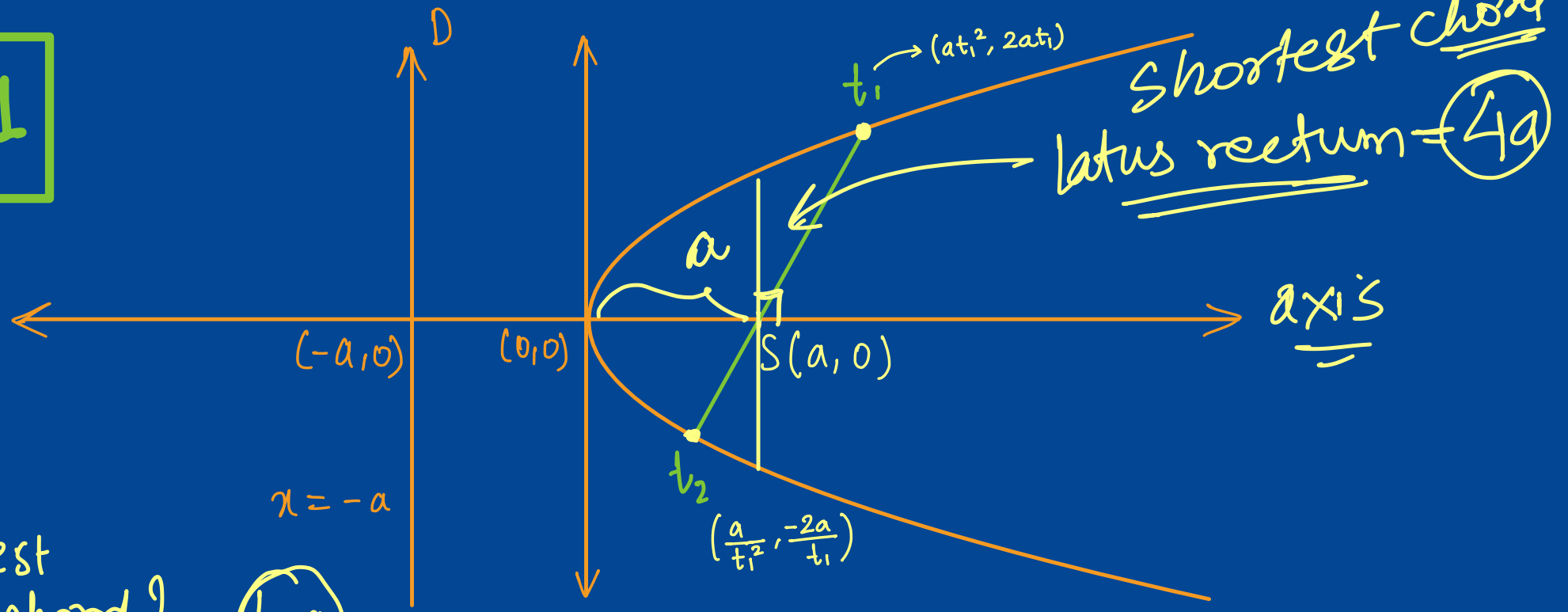


FOCAL CHORD ⇒ chord passing from the focus of the parabola

$$t_1 \cdot t_2 = -1$$

$$t = -\frac{1}{t_2}$$

Smallest focal chord ! = $4a$



Position of a point P(h,k) with respect to Parabola

$$k^2 - 4ah = \begin{cases} > 0 & \Rightarrow \text{outside} \\ = 0 & \Rightarrow \text{on the parabola} \\ < 0 & \Rightarrow \text{inside} \end{cases}$$

$y^2 = 4ax$

$k \quad h$

$k^2 - 4ah$

$4a = 4$

$a = 1$

$(h, k) \Rightarrow (y-k)^2 = 4a(x-h)$

$(0, 3)$

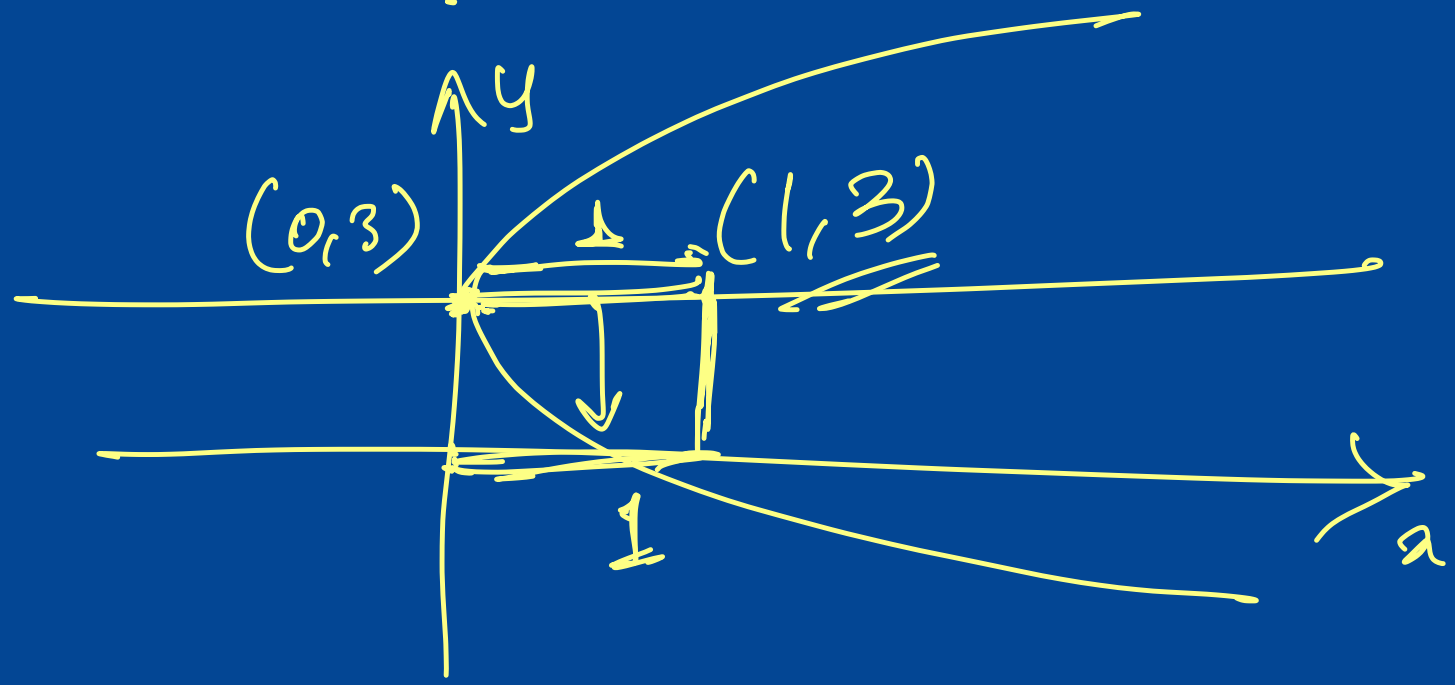
The focus of the parabola $(y - 3)^2 = 4x$ is

(a) (-1, -3)

(b) (-1, 3)

(c) (1, -3)

(d) (1, 3)



$y^2 = 4ax$

$x^2 - 4y + 8 = 0$

The equation of the axis of the parabola ~~$x^2 - 4y + 8 = 0$~~ is

(a) y = 0

(b) y = 2

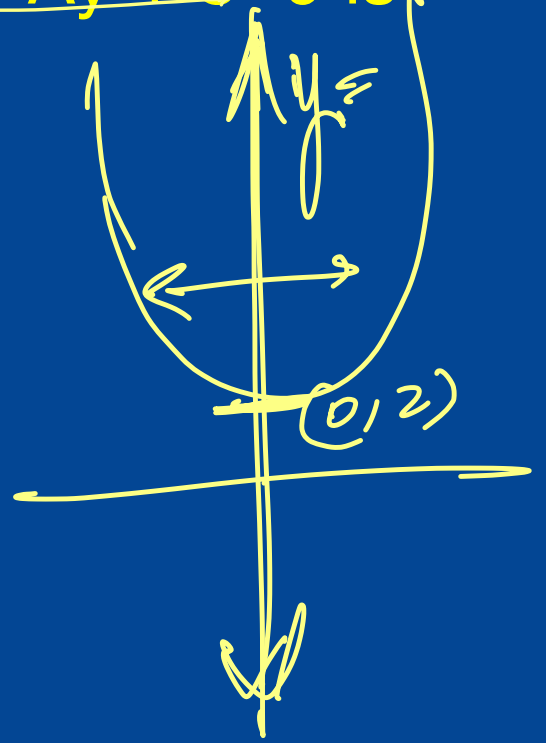
(c) x = 0

(d) x = 2

$x^2 = 4y - 8$

$x^2 = 4(y - 2)$

$(0, 2)$



latus rectum

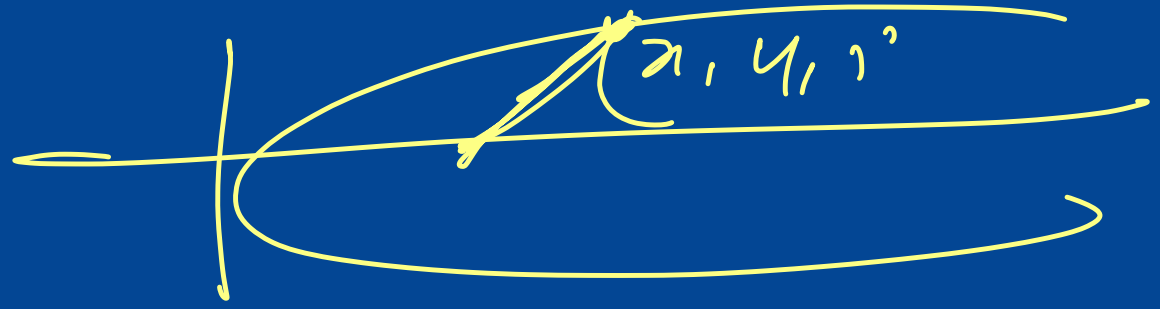
What is the length of the smallest focal chord of the parabola $y^2 = 4ax$?

(a) a

(b) 2a

(c) 4a

(d) 8a



What is the focal distance of any point $P(x_1,y_1)$ on the parabola $y^2=4ax$?

(a) $x_1 + y_1$

(b) X_1y_1

(c) ~~ax_1~~

(d) $a+x_1$

What is the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the end of the latusrectum?

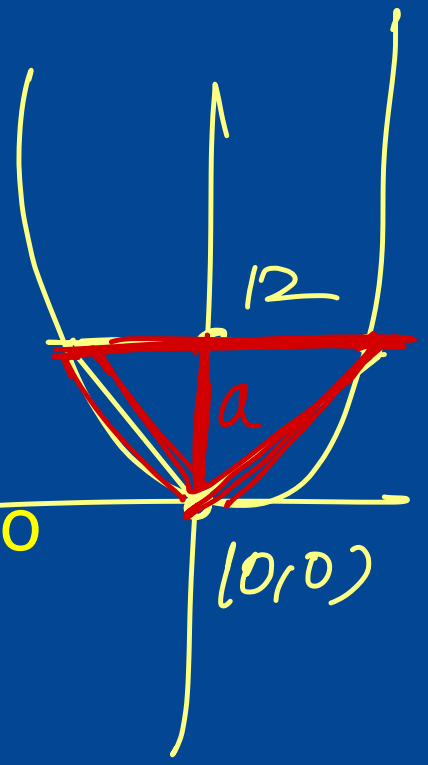
(a) 9 sq units

(b) 12 sq units

(c) 14 sq units

(d) 18 sq units

$4a = 4 \times 3 = 12$



$x^2 = 4ay$

$12y = 4ay$

$\frac{12}{4} = a \Rightarrow 3$

$\frac{1}{2} \times 12 \times 3$

6

$y^2 = 4ax$

$(y-1)^2 = 4a(x-1)$

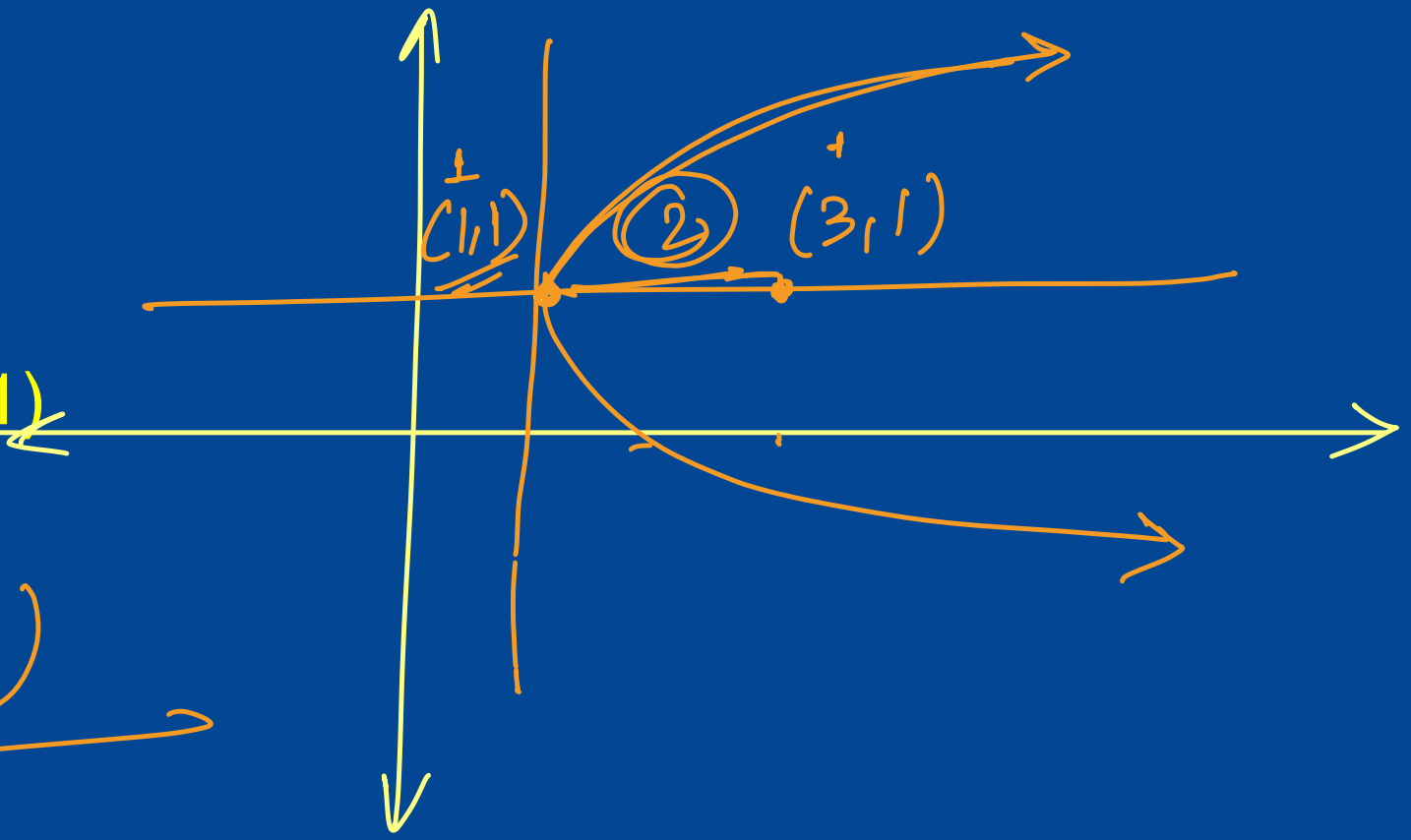
Equation of the parabola with its vertex at (1,1) and focus (3, 1) is

(a) $(x-1)^2 = 8\,(y-1)$

(b) $(y-1)^2 = 8\,(x-3)$

(c) $(y-1)^2 = 8(x-1)$

(d) $(x-3)^2 = 8\,(y-1)$



$(y-1)^2 = 8(x-1)$

$(x-0)^2 = -4a(y-6)$ $\quad a = 3$ $\quad x^2 = -4ay$

If (0, 6) and (0, 3) are, the vertex and focus of a parabola, respectively then its equation is

(a) $x^2 + 12y = 72$

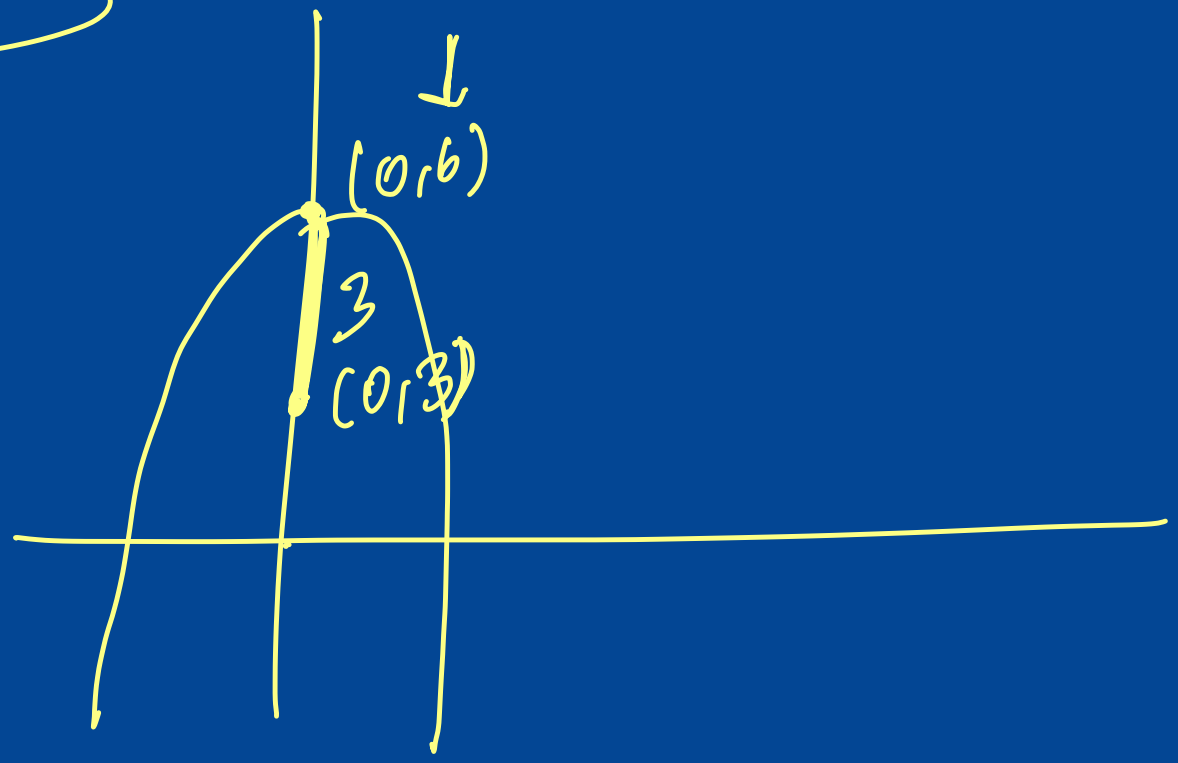
(b) $x^2 - 12y = 72$

(c) $y^2 - 12x = 72$

(d) $y^2 + 12x = 72$

$x^2 = -12(y-6)$

$x^2 + 12y = 72$



5/2

$4a = 2$

$a = 2/4 = 1/2$

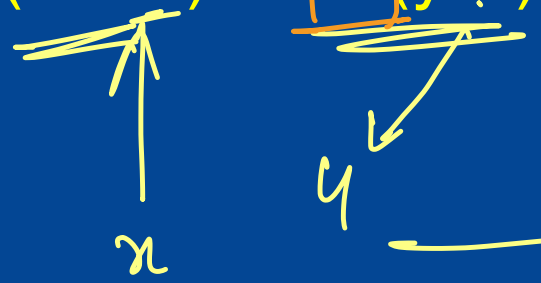
The equation of directrix $(x - 1)^2 = 2(y-2)$ is

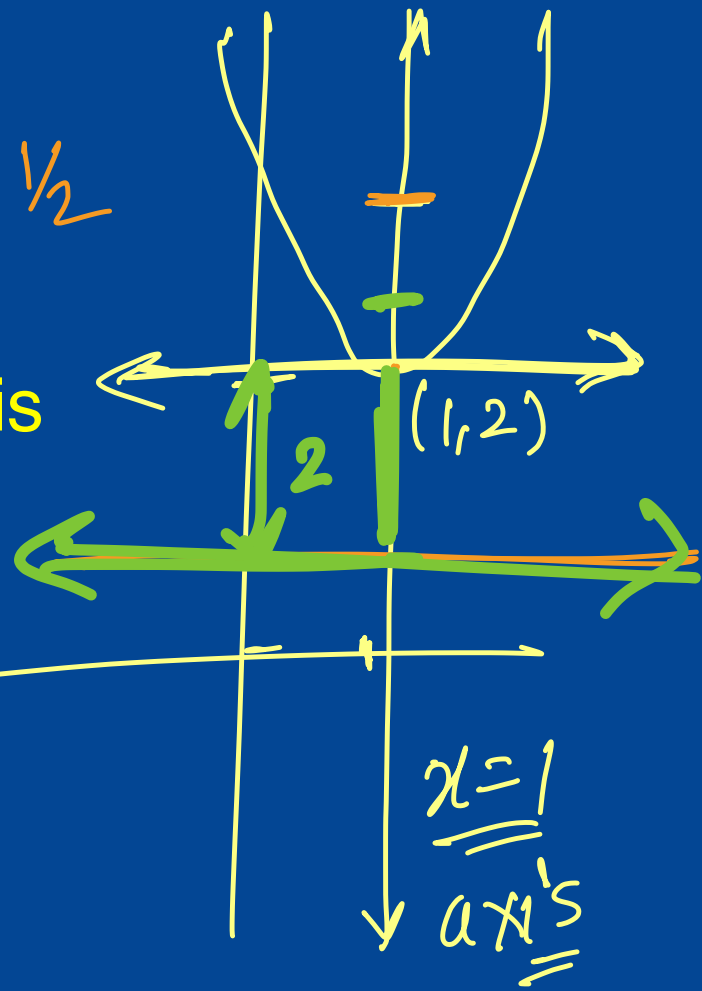
(a) $2y + 3 = 0$

(b) ~~$2x + 1 = 0$~~

(c) $2y - 3 = 0$

(d) $2y - 1 = 0$





(1, 2) $\left(\frac{3}{2}\right)$

$y = 3/2$

$2y - 3 = 0$

The focal distance of a point on the parabola $y^2 = 8x$ is 4. Its ordinates are

(a) ±1

(b) ± 2

(c) ± 3

(d) ± 4

$y^2 = 8x$

$y^2 = 4ax$

$a = 2$

(x_1, y_1)

$y_1^2 = 8(2)$

$y_1^2 = 16$

$y_1 = \pm 4$

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