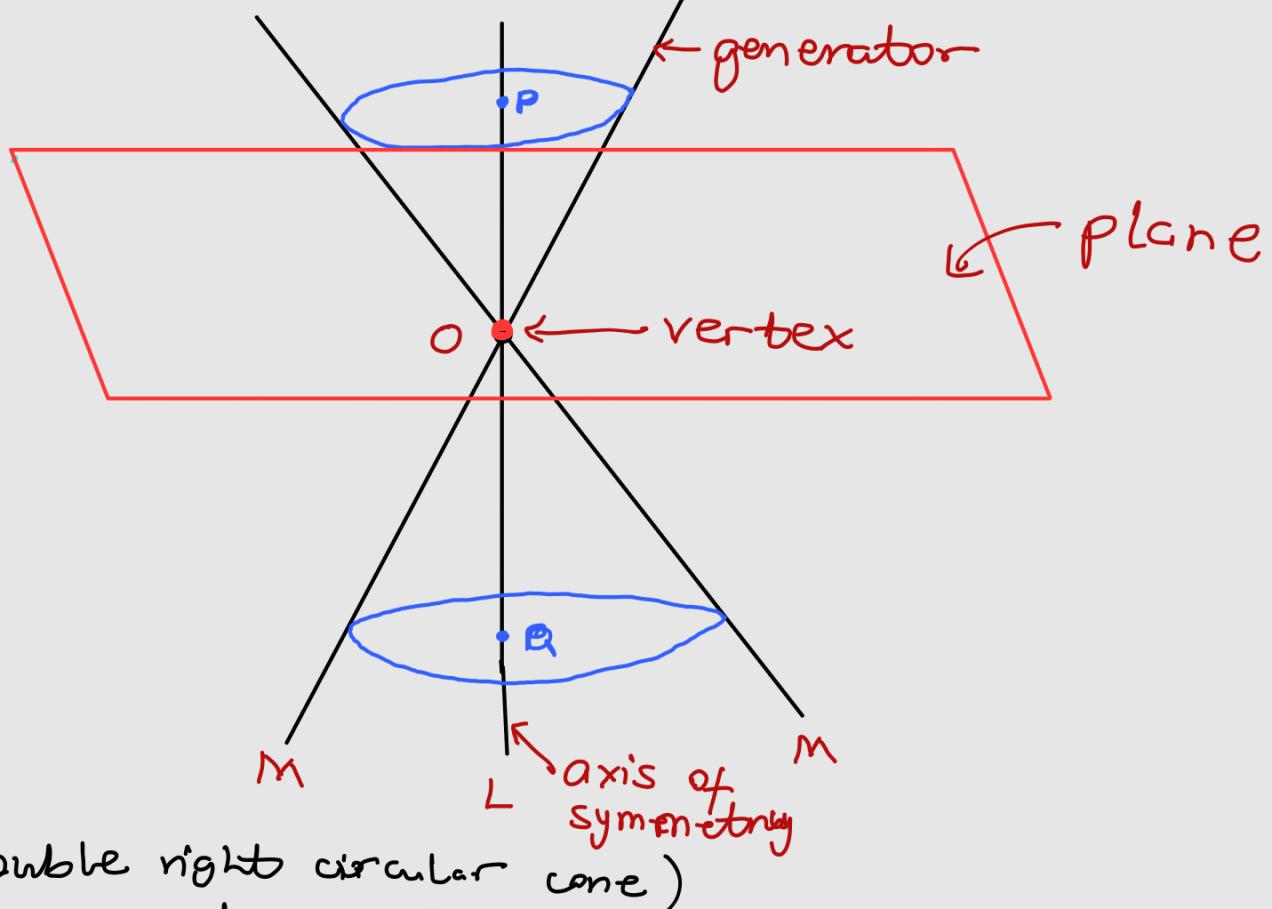


Math 126 (Module 3)

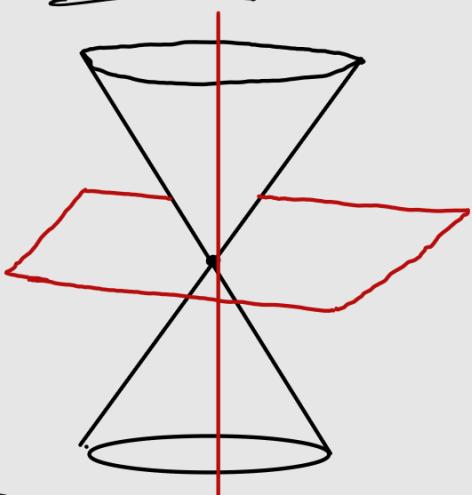
Conics :

Geometric construction of conic sections.



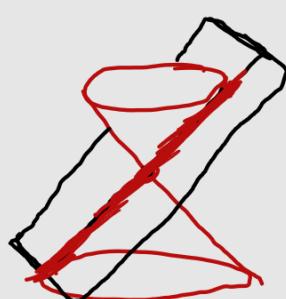
Degenerate conics:

① Point :



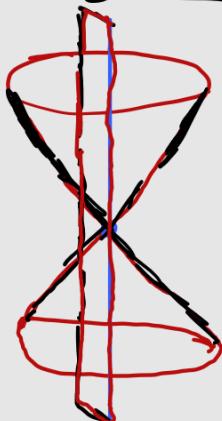
- cutting plane passes through the vertex .
- cutting plane is perpendicular to the axis of symmetry.
- cutting plane do not cut any of the cone.

② line :



- cutting plane passes through the vertex .
- cutting plane contains a generator.

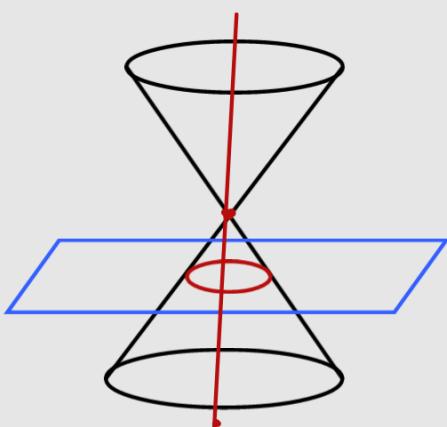
③ Crossed lines :



- cutting plane passes through the vertex.
- cutting plane contains the axis of symmetry.

Non-degenerate conics :

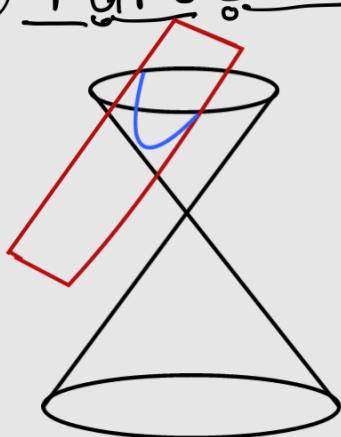
① Circle :



The cutting plane :

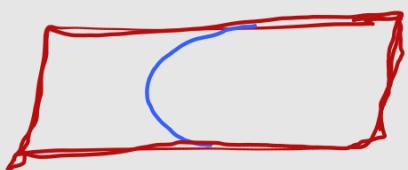
- cut only one piece of the cone.
- is perpendicular to the axis of symmetry.
- do not contain the vertex.

② Parabola :

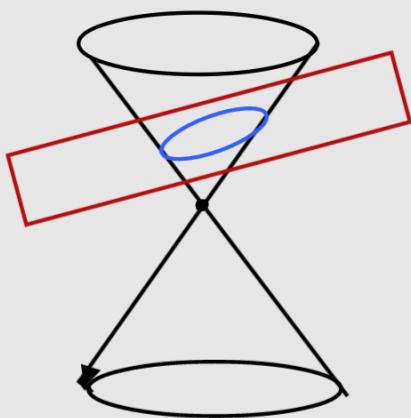


The cutting plane :

- cut only one piece of the cone
- is parallel to a generator
- is not perpendicular to the axis of symmetry.
- do not contain the vertex.



③ Ellipse:

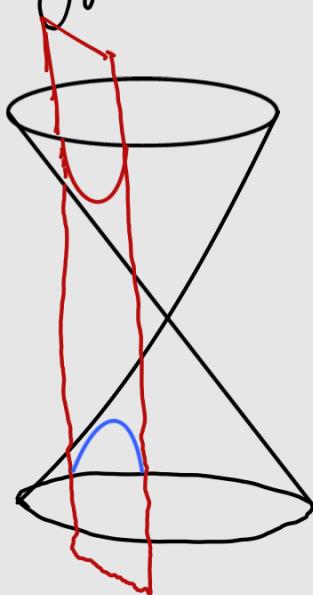


The cutting plane:

- do not contain a vertex.
- not parallel to a generator
- not perpendicular to axis of symmetry
- cut only one piece of the cone.



④ Hyperbola:



The cutting plane:

- do not contain the vertex.
- cut two pieces of the cone at any angle.
- produces two parts called branches.

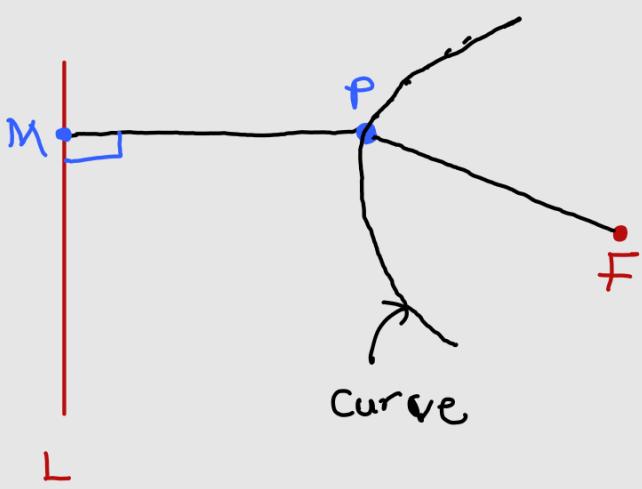


Conic Section as a plane curve.

Defn: (^(Point)Focus - ^(Line)Directrix definition) :

The set of points $P(x,y)$ in a plane such that distance of each point P from a fixed point F is a constant multiple e of its distance from a fixed line L .

$F = \text{focus},$	$e = \text{eccentricity}$
$L = \text{directrix}$	$P = \text{any point}$



$$|FP| = e |PM|$$

$$e = \frac{|FP|}{|PM|}$$

- A parabola if $e=1 \Rightarrow |FP|=|PM| \forall P$
- An ellipse if $0 < e < 1 \Rightarrow |FP| < |PM| \forall P$
- A hyperbola if $e > 1 \Rightarrow |FP| > |PM| \forall P$

Equation of the conics with a given focus and directrix:

$$\begin{aligned} \bullet P(x, y), \quad F(p, q), \quad lx + my + n = 0 \quad (\text{directrix}) \\ |FP| = e |PM| \\ |FP|^2 = e^2 |PM|^2 \\ (x-p)^2 + (y-q)^2 = e^2 \left(\frac{lx + my + n}{\sqrt{l^2 + m^2}} \right)^2 \end{aligned}$$

$$ax^2 + by^2 + cxy + dx + hy + f = 0$$

$$a = (1 - e^2) l^2 + m^2$$

$$b = (1 - e^2) m^2 + l^2$$

$$c = -2lm e^2$$

$$d = -2(p + ln e^2)$$

$$h = -2(q + mn e^2)$$

$$f = q^2 - n^2 e^2$$

Discriminant: $(b^2 - 4ac)$

- $b^2 - 4ac < 0$, (ellipse)
- $b^2 - 4ac = 0$, (parabola)
- $b^2 - 4ac > 0$, (hyperbola)

The parabola

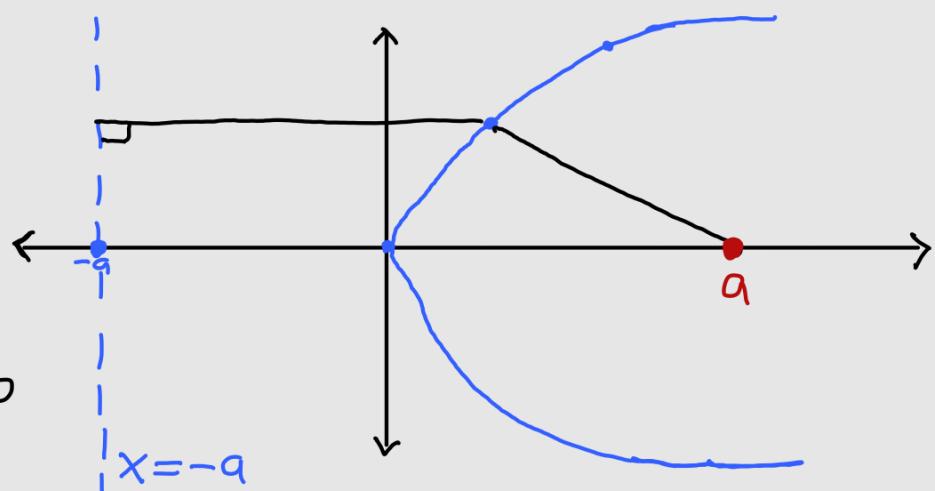
$$|FP| = |PM|$$

$$e = 1$$

Focus $F(a, 0)$

Directrix : $x = -a$

$M(-a, 0)$ $x + a = 0$



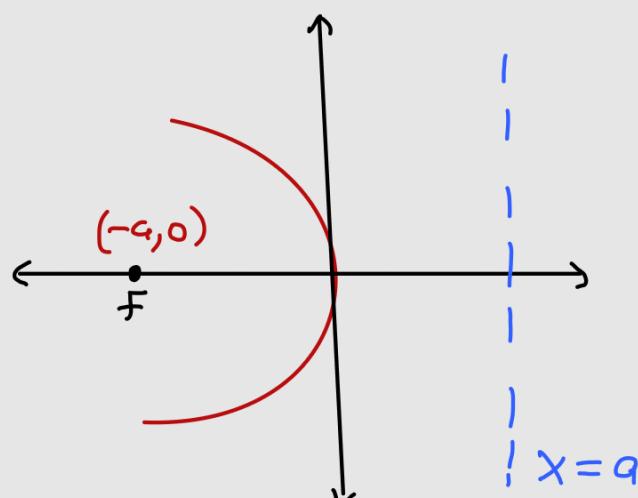
$$|FP| = |PM|$$

$$(x-a)^2 + (y-0)^2 = (x+a)^2$$

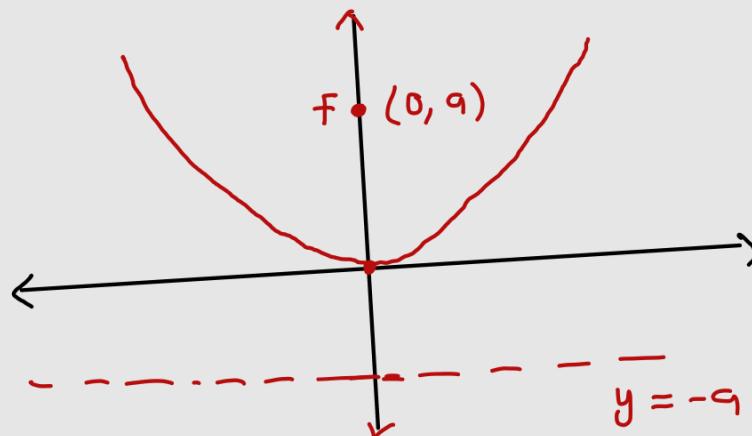
$$x^2 - 2ax + a^2 + y^2 = x^2 + 2ax + a^2$$

$$y^2 = 4ax$$

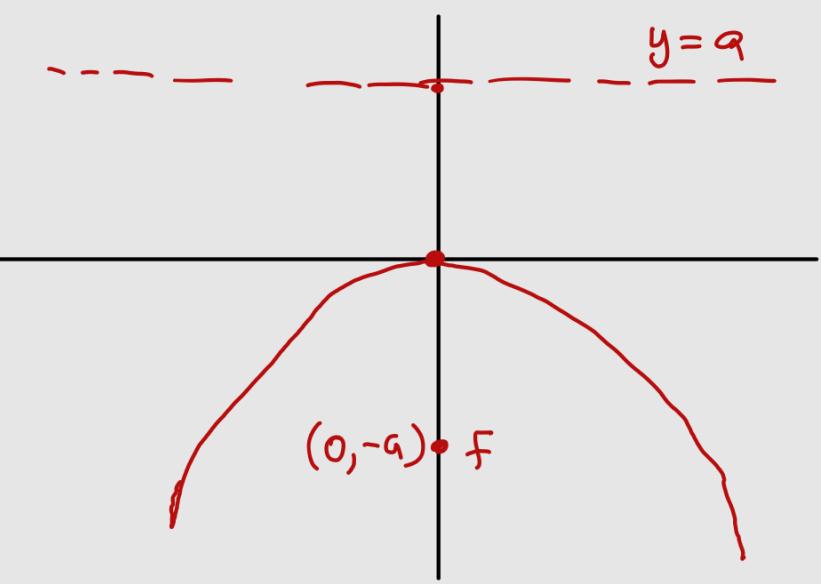
- Standard
Cartesian
equation



$$y^2 = -4ax$$



$$x^2 = 4ay$$



$$x^2 = -4ay$$

⚠️ IMPORTANT INF. ABOUT I.A.

DATE : Saturday, 9th August, 2025

TIME : 12:00 PM

VENUES 10274752 - 22384641
(New N'Block)

22384783 - 22416356
(GCB)

TOPICS : MODULE 1 and 2 (Matrices and Complex Numbers)

- * Dr. Gloria and Dr. Edward
- * Solve questions in Dr. Edwards lectures
- * 1, 1, 1, KD
- * 1, 1, 1, exercises
- * No objectives
- * Like first I.A. (7 or 6 questions)
- * 75 minutes or 60 minutes.



f - focus
L - directrix

$$|PF| = e|PM|$$

$$e = 1 \text{ (Parabola)}$$