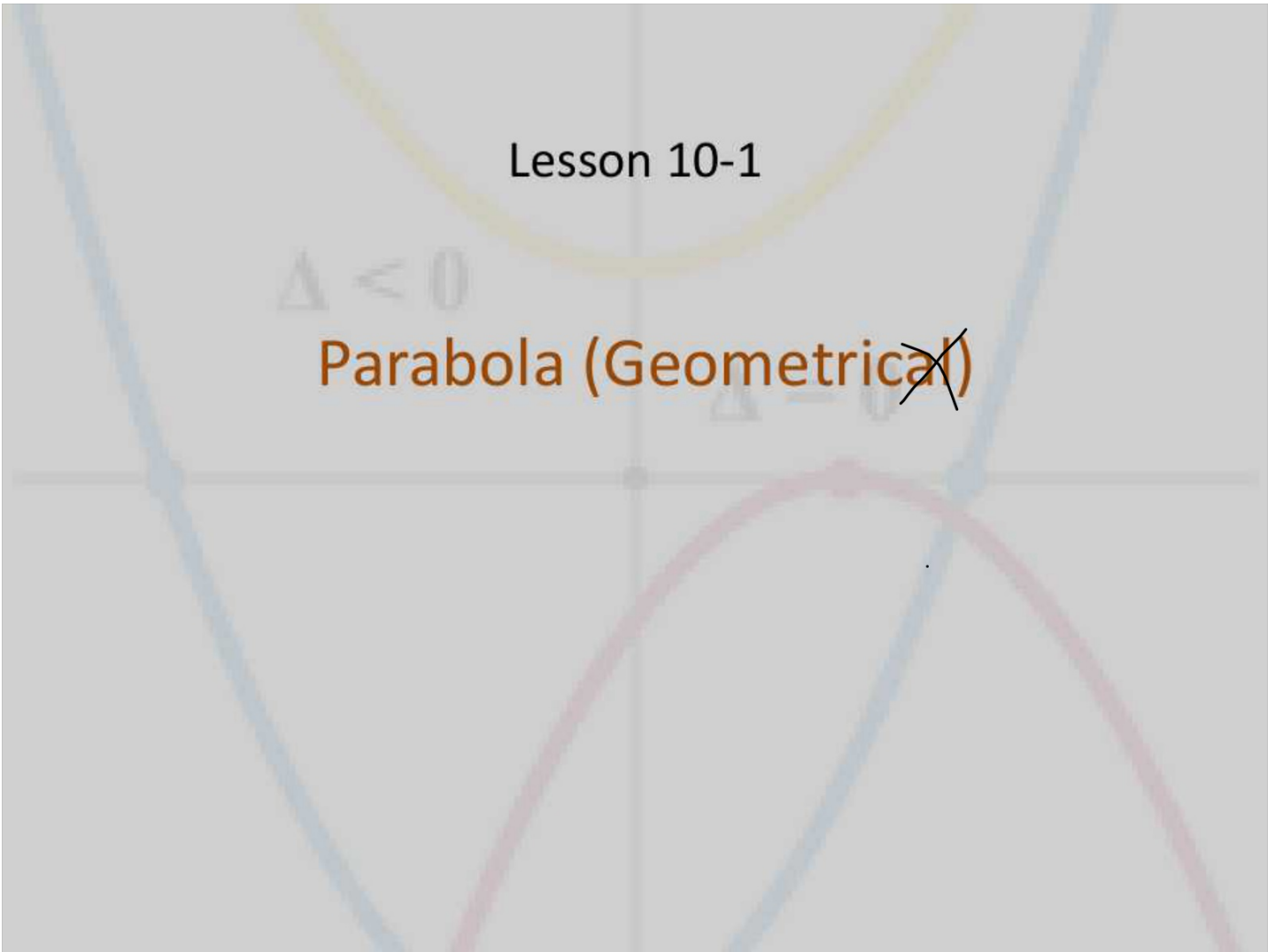


Lesson 10-1

$\Delta < 0$

Parabola (Geometrical)

$\Delta = 0$



Objective

Students will...

- Be able to give a geometric definition of a parabola.
- Be able to define focus (foci), directrix, axis of symmetry, and vertex.
- Be able to find the equation of a parabola.

Parabola within a Cone

As seen from yesterday's video, a parabola can be cut out from a cone. Parabolas are easily found in the real-world.



Parabola

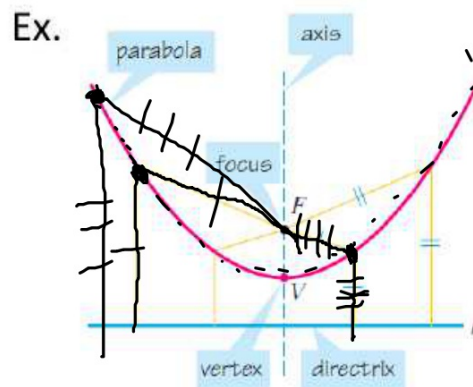


The trajectory of a basketball is a parabola.

Geometric Parabola

We worked extensively with parabolas **algebraically** back in chapters 2 and 3. Here in this chapter, we now look at parabolas **geometrically**.

Geometric Definition of a Parabola- A parabola is a set of points in the plane **equidistant** from a fixed point F (called the **focus**) and a fixed line l (called the **directrix**). We define the vertex as the point that lies **halfway** between the **focus** and the **directrix**, and the **axis of symmetry** is the line that runs through the focus **perpendicular** to the directrix.



Equations and Graphs of Parabolas

Using the distance formula, we can see that parabolas have the following equations:

Vertical

Opening up or down

$$x^2 = 4py$$

✱ Vertex: $V(0,0)$

Focus: $F(0, p)$

Directrix: $y = -p$

Focal Diameter: $4p$

(the number in front of y)

Opens...

Up: $p > 0$

Down: $p < 0$

horizontal .

Opening left or right

$$y^2 = 4px$$

$V(0,0)$

$F(p, 0)$

$x = -p$

$4p$

(the number in front of x)

Right: $p > 0$

Left: $p < 0$

Example

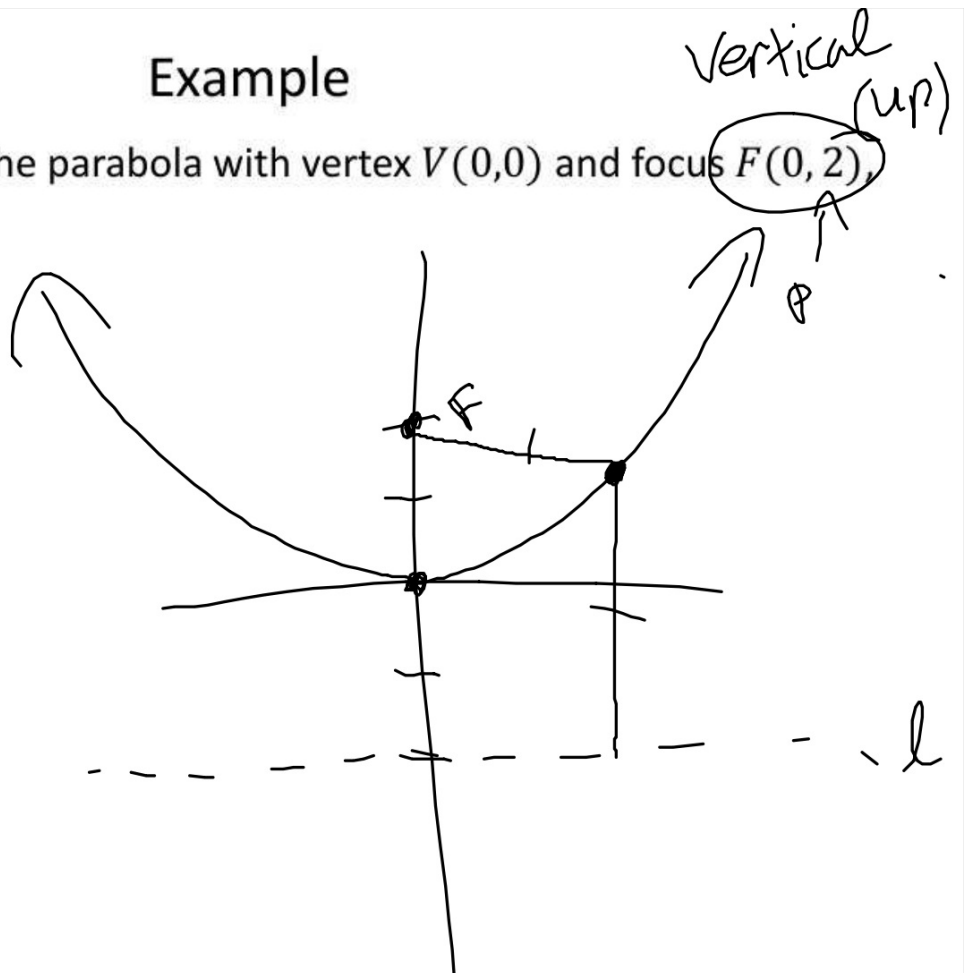
Find the equation of the parabola with vertex $V(0,0)$ and focus $F(0,2)$, and sketch its graph.

$$x^2 = 4py$$

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

$$x^2 = 8y$$

$$D: y = -2$$

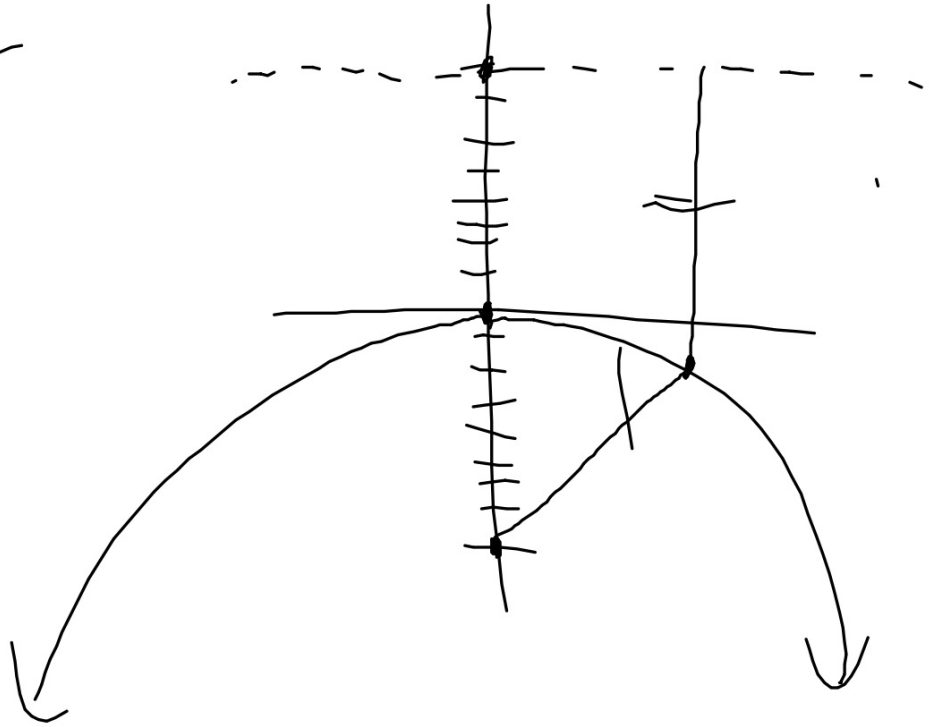


Example

Find the equation of the parabola with vertex $V(0,0)$ and focus $F(0, -8)$, and sketch its graph.

$$x^2 = -32y$$

$$y = 8$$



Example

hori z.

A parabola has the equation $6x + y^2 = 0$. Find its focus, directrix, and the focal diameter, and sketch its graph.

$$y^2 = -6x$$

$$y^2 = 4Px$$

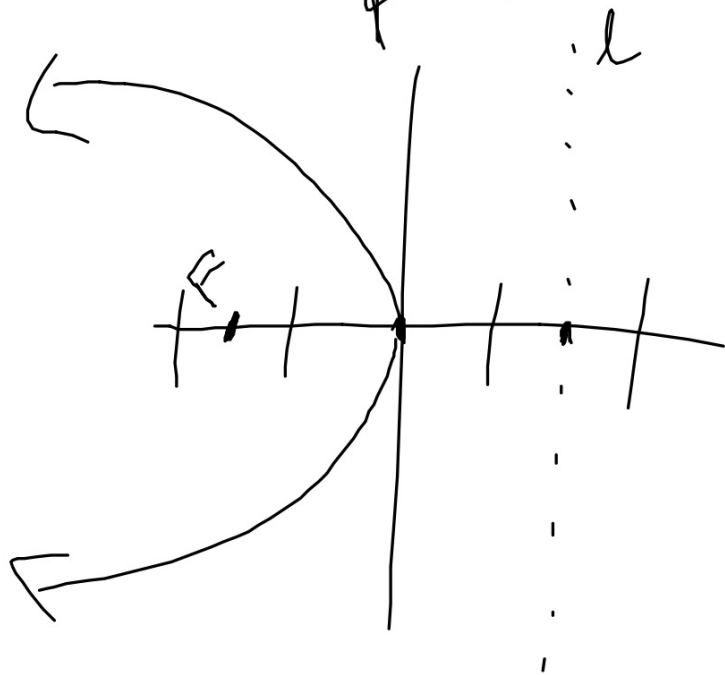
$$\frac{4P}{4} = \frac{-6}{4} = -\frac{3}{2}$$

$$V: (0, 0)$$

$$FD: \cancel{6}$$

$$F: (-\frac{3}{2}, 0)$$

$$D: x = \frac{3}{2}$$



Homework Problems

Find the focus, directrix, and focal diameter of the parabola, and sketch its graph.

7. $y^2 = 4x$

16. $x - 7y^2 = 0$

Homework Problems

Find an equation for the parabola that has its vertex at the origin and satisfies the given condition(s).

29. Directrix $x = 2$

35. Opens upward with focus 5 units from the vertex.

Homework 4/6

TB pg. 751 #1-6, 7-17 (odd), 25, 27, 29, 33, 35