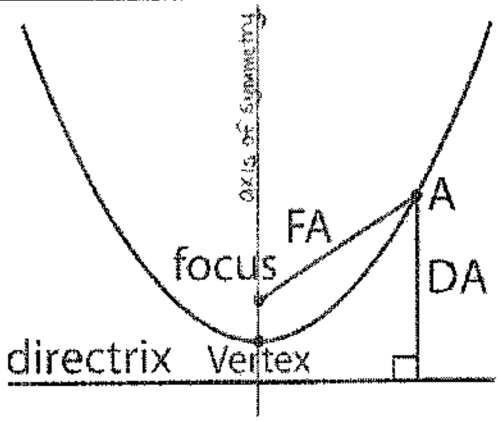
Algebra 2: Chapter 2.3 Notes

Parabolas

Key



A parabola is a set of points such that each point is equidistant from a fixed point called the **focus** and a fixed line called the **directrix**. The focus and directrix each lie p units from the vertex.

Standard Form: Opens Vertical: $y = \frac{1}{4p}(x-h)^2 + k$ Opens Horizontal: $x = \frac{1}{4p}(y-k)^2 + h$

$p > 0$ ⇑ $p < 0$ ⇓ $p > 0$ ⇒ $p < 0$ ⇐

Specify the **Direction of Opening**, find the equation of the **Axis of Symmetry**, the coordinates of the **Vertex**, the coordinates of the **Focus**, and the equation of the **Directrix** for each parabola. Then sketch a quick a graph.

1. $-4x = y^2$

$\frac{-4x}{-4} = \frac{y^2}{-4}$

$x = -\frac{1}{4}y^2$

Horizontal

$4p = 4$

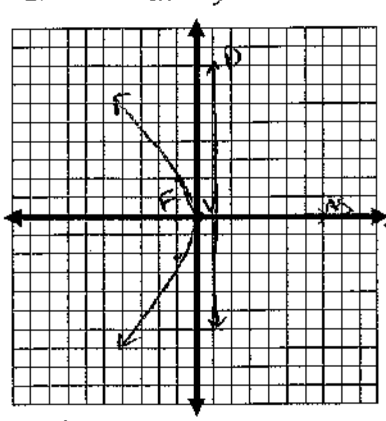
$p = 1$

Vertex (0,0)

Focus (−1,0)

AS: $y = 0$

Directrix $x = 1$



x	y
−1	±2

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

$4 = y^2$

$\pm 2 = y$

2. $y = -\frac{1}{8}(x-6)^2$

Vertical

$4p = 8$

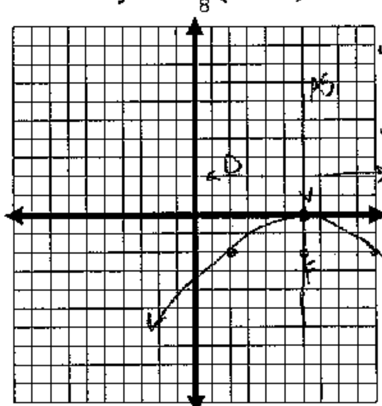
$p = 2$

Vertex (6,0)

Focus (6,−2)

Directrix $y = 2$

AS: $x = 6$



$-\frac{1}{8}(2-6)^2$

$-\frac{1}{8}(-4)^2$

$-\frac{1}{8}(16)$

-2

$-\frac{1}{8}(5-6)^2$

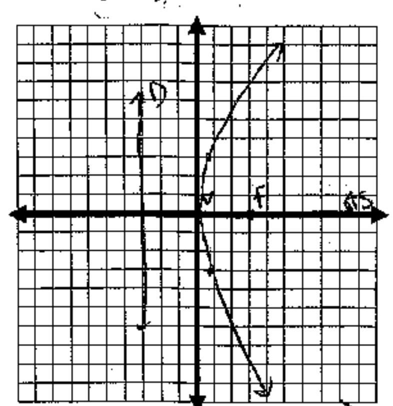
$-\frac{1}{8}(-1)^2$

$-\frac{1}{8}(1)$

x	y
5	−1/8
2	−2

3. $12x = y^2$

$x = \frac{1}{12}y^2$



$4p = 12$

$p = 3$

Horizontal

Vertex (0,0)

Focus (3,0)

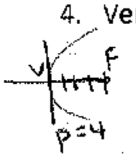
AS: $y = 0$

Directrix: $x = -3$

x	y
3/4	3

Write an equation in standard form for the information given for each parabola.

4. Vertex (0,0), Focus (4, 0)



h k

$p = 4$

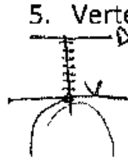
Horizontal

so $x = \frac{1}{4p}(y-k)^2 + h$

$x = \frac{1}{4(4)}(y-0)^2 + 0$

$\boxed{x = \frac{1}{16}y^2}$

5. Vertex (0, 0) Directrix y = 8



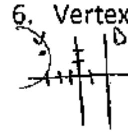
h k

$p = 8$ Vertical

$y = \frac{1}{4(8)}(x-0)^2 + 0$

$\boxed{y = -\frac{1}{32}x^2}$

6. Vertex (-3, 2), Directrix x = 2



H K

Horizontal

$p = 5$

$x = \frac{1}{4(5)}(y-2)^2 - 3$

$\boxed{x = -\frac{1}{20}(y-2)^2 - 3}$

7. Application:

The EuroDish, developed to provide electricity in remote areas, uses a parabolic reflector to concentrate sunlight onto a high-efficiency engine located at the reflector's focus. The sunlight heats helium to 650°C to power the engine.

1. Write an equation for the EuroDish's cross section with its vertex at (0,0).
2. How deep is the dish?

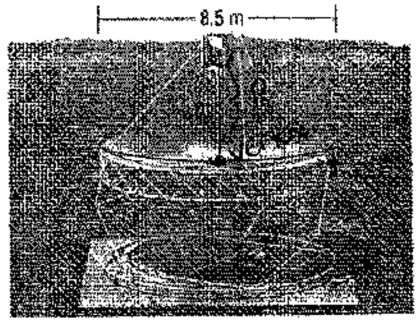
$p=4.5$ Vertical

$y=\frac{1}{4p}(x-h)^2+k$

vertex (0,0)

$y=\frac{1}{4(4.5)}(x-0)^2+0$

$y=\frac{1}{18}x^2$



depth is the y-value at the dish's outside edge. The dish is $\frac{8.5}{2}=4.25$ m to either side of the vertex So sub 4.25 in for x into eq.

$y=\frac{1}{18}(4.25)^2$

$y=\frac{1}{18}(18.0625)$

$y=1$

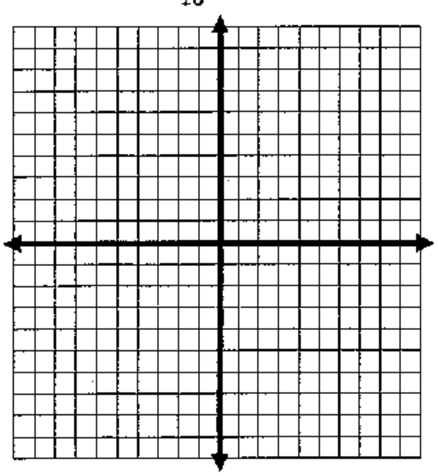
Step 1: Write an equation for the cross section. $y=\frac{1}{18}x^2$

Step 2: Find the depth of the EuroDish.

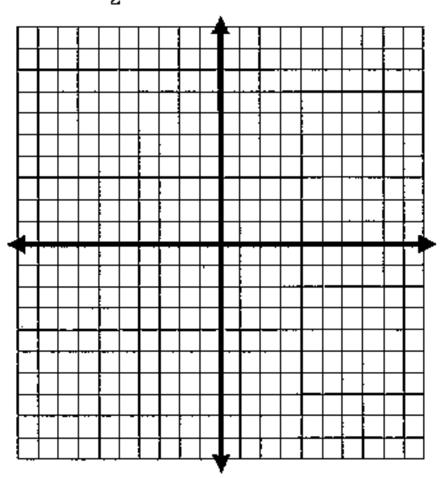
The dish is about ___1___ meter deep.

Extra Practice if Time:

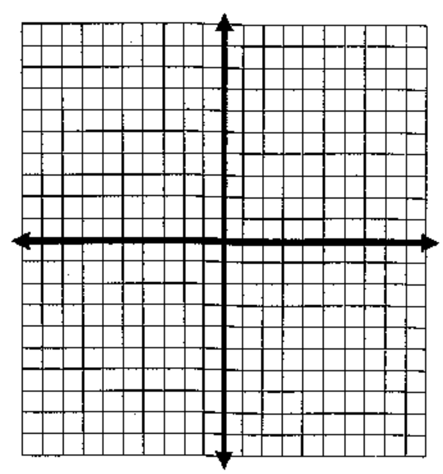
A. $y=\frac{1}{16}x^2-1$



B. $x=\frac{1}{2}(y+7)^2+3$



C. $y^2=-24x$



D. Vertex (0, 0), Focus (6, 0)

E. Focus (0, 3), Directrix x = 1

F. Vertex (6, 0), Directrix y= -1