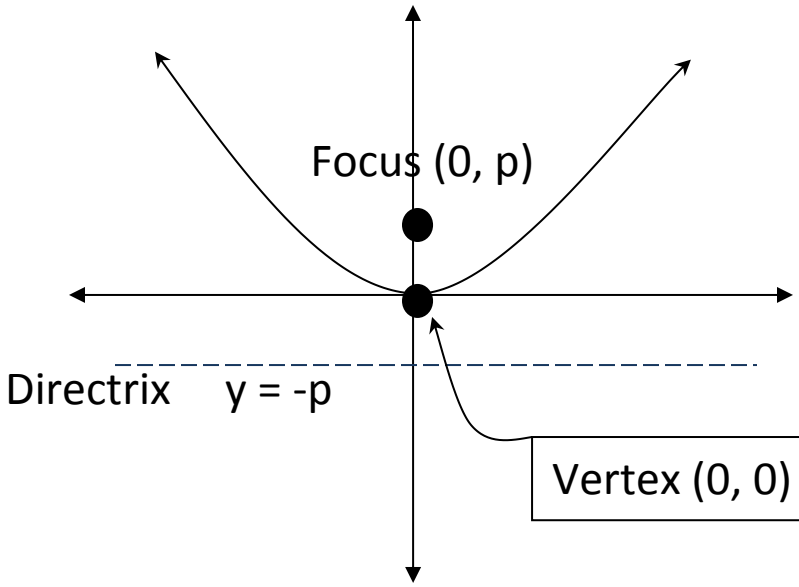
College Review Math

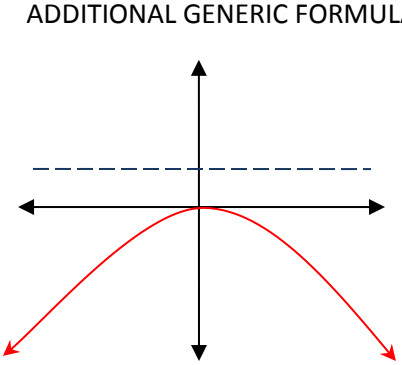
Section 6D

PARABOLAS

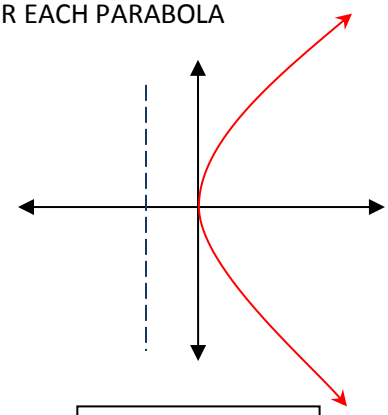


$$y = \frac{1}{4p}x^2$$ Generic Parabola formula

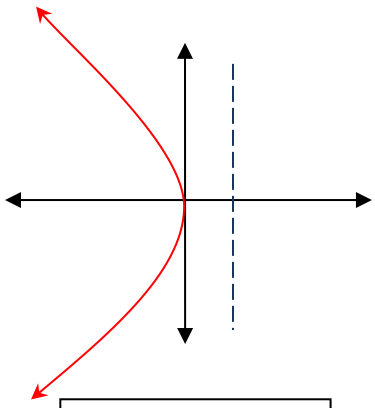
ADDITIONAL GENERIC FORMULAS FOR EACH PARABOLA



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



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



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

Examples (find the vertex, focus and directrix) The vertices for #1-3 are all (0, 0)

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

$\frac{1}{4p} = \frac{1}{16}$ Since this equation
4p = 16 represents a parabola
p = 4 facing up, the focus is 4 units up (0, 4) and directrix is 4 units down (y = -4).

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

$\frac{1}{4p} = \frac{1}{20}$ Since this equation
4p = 20 represents a parabola
p = 5 facing left, the focus is 5 units left (-5, 0) and directrix is 5 units right (x = 5).

3) $x = 2y^2$

$\frac{1}{4p} = \frac{2}{1}$ Since this equation
8p = 1 represents a parabola
p = 1/8 facing right, the focus is 1/8 unit right (1/8, 0) and directrix is 1/8 units left (y = -1/8).

Examples (NOT AT THE ORIGIN)

Continue to use the coefficient in front (of the parenthesis) for use in the formula (1/4p).

1) $y + 2 = (x - 3)^2$

Vertex: (3, -2)

$\frac{1}{4p} = \frac{1}{1}$ Since this equation

4p = 1 represents a parabola

p = 1/4 facing up, the focus is 1/4 unit up (3, -7/4) and directrix is 1/4 unit down (y = -9/4).

2) $x - 3 = -\frac{1}{8}(y-1)^2$

Vertex: (3, 1)

$\frac{1}{4p} = \frac{1}{8}$ Since this equation

4p = 8 represents a parabola

p = 2 facing left, the focus is 2 units left (1, 1) and directrix is 2 units right (x = 5).

3) $y - 5 = -3x^2$

Vertex: (0, 5)

$\frac{1}{4p} = \frac{3}{1}$ Since this equation

12p = 1 represents a parabola

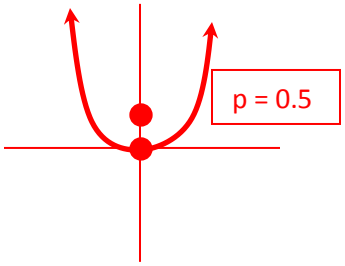
p = 1/12 facing down, the focus is 1/12 unit down (0, 59/12) and directrix is 1/4 unit up (y = 61/12).

Find an equation for each parabola. IT WILL be helpful to ***sketch*** the graph.

Homework:

pg. 240 1-8 (ignore "translations")

1) Vertex (0, 0)
Focus (0, .5)



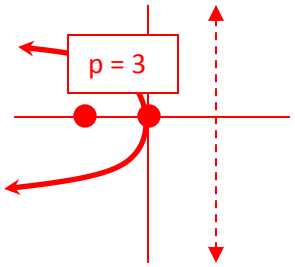
The parabola faces up, therefore the proper equation is: $y = \frac{1}{4p}x^2$

Sub 0.5 in for p:

$$y = \frac{1}{4(0.5)}x^2$$

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

2) Focus (-3, 0)
directrix; x = 3

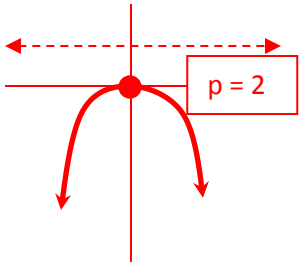


The vertex is (0, 0) since it occurs half way between the focus & directrix.

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

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

3) Vertex (0, 0)
directrix; y = 2



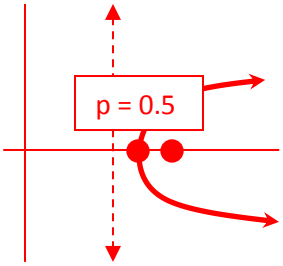
The parabola faces down, therefore the proper equation is:

$y = -\frac{1}{4p}x^2$ Sub in 2.

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

$$y = -\frac{1}{8}x^2$$

4) Focus (4.5, 0)
directrix; x = 3.5



The vertex is (4, 0) since it occurs half way between the focus & directrix.

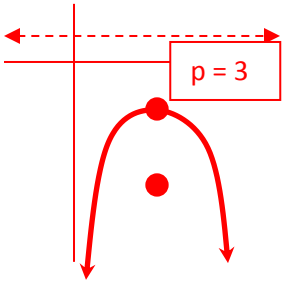
$$x = \frac{1}{4(0.5)}y^2$$

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

Since the vertex is not at the origin, the equation must be adjusted:

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

5) Focus(3, -5)
directrix; y = 1



The vertex is (3, -2) or half way between focus & directrix. Sub in 3.

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

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

Adjust equation for the vertex:

$$y + 2 = -\frac{1}{12}(x-3)^2$$