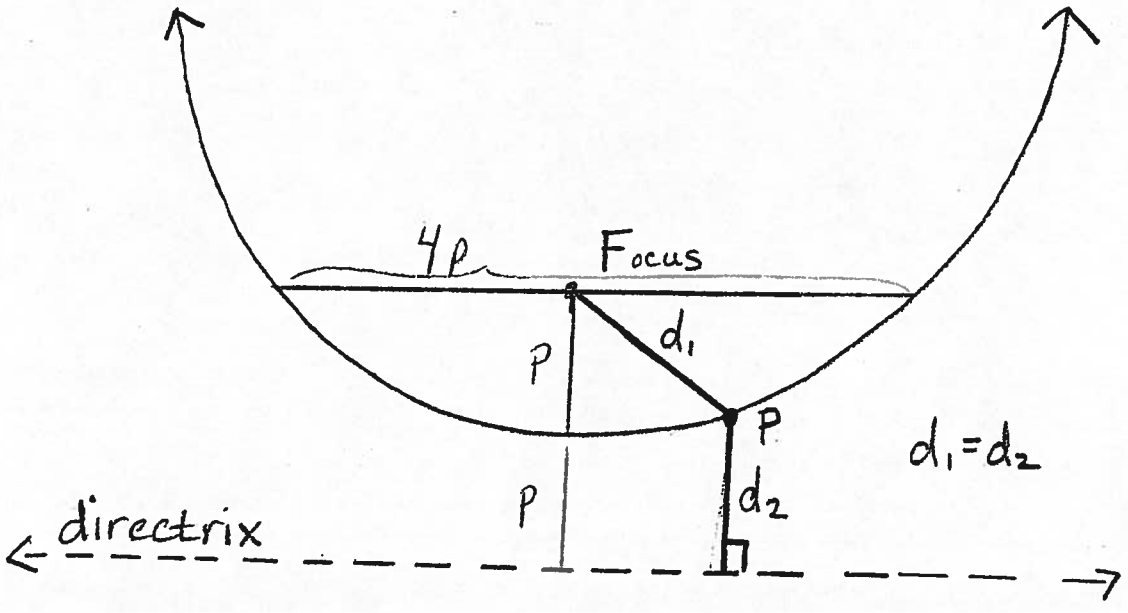
Algebra II
Mrs. Baxter
Name_____ **Parabolas**

Goal:
To write equations of parabolas
To graph parabolas having certain properties

Why:
We can graph parabolas to solve problems involving manufacturing and communications

Definitions:
1) **conic section** –any section that can be formed by slicing a double cone (see p. 415)

2) **parabola** – set of all points in a plane that are the same distance from a given point called the **focus** and a given line called the **directrix**. (see diagram below)



Theorem:
If a parabola is translated so that its vertex is (h, k) and its axis of symmetry is **parallel to the y-axis**, it has an equation of $(x-h)^2 = 4p(y-k)$, where the focus is (h, k+p) and the directrix is $y = k - p$.

If a parabola is translated so that its vertex is (h, k) and its axis of symmetry is **parallel to the x-axis**, it has an equation of $(y-k)^2 = 4p(x-h)$, where the focus is (h+p, k), and the directrix is $x = h - p$.

Practice problems:

1) Find the vertex, focus and directrix for the parabola $x^2 + 6x + 4y + 5 = 0$. Then draw the graph. (Step 1- Isolate the squared variable and its linear term, then complete the square).

Ex. 2 Find the vertex, focus, and directrix for the parabola $y2 + 6y - 8x - 31 = 0$. Then draw the graph.

Ex. 3 Find the equation of a parabola with focus (3,9) and directrix $y = -1$.

Ex. 4 Find the equation of a parabola with focus (3,9) and vertex (5,9).

5. Application: An automobile headlight contains a parabolic reflector. A special bulb with two filaments is used to produce the high and low beams. The filament placed at the focus produces the high beam and the filament placed off the focus produces the low beam. The equation of the cross section of the reflector is $y = \frac{1}{12} x^2$. How far from the vertex should the filament for the high beam be placed?

6. Baseball: When a ball is thrown, the path it travels is a parabola. Suppose a baseball is thrown from ground level, reaches a maximum height of 50 feet, and hits the ground 200 feet from where it was thrown. Assuming this situation could be modeled on a coordinate plane with the focus of the parabola at the origin, find the equation of the (parabolic) path of the ball. (Hint: the focus is at ground level)