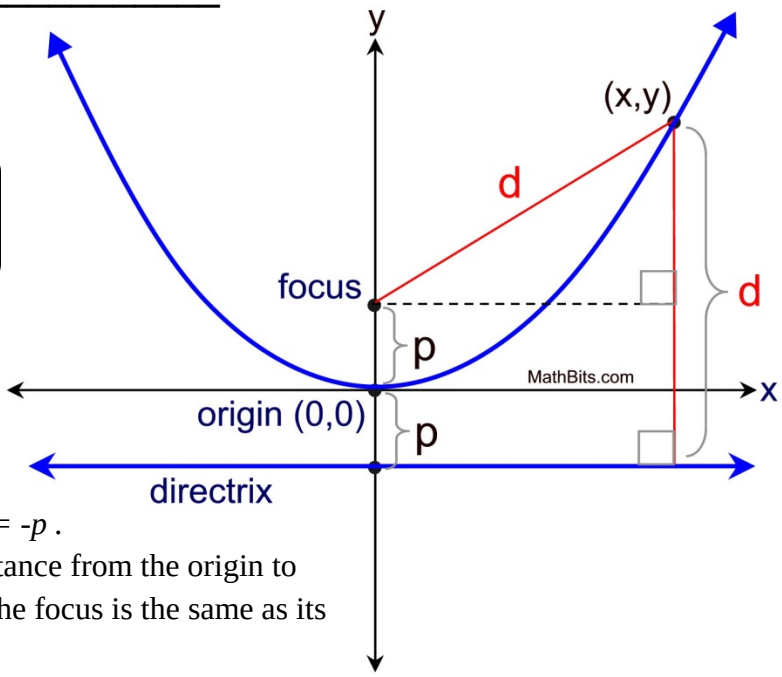
Name_____

Derive the Equation of a Parabola (Vertex at Origin)

Definition: A parabola is the set of points equidistant from a fixed line (the directrix) and a fixed point (the focus) not on the line.



Given: a parabola with vertex at (0,0) and a focal length of p

Show: the equation of the parabola is $y = \frac{1}{4p}x^2$.

Known: The focus is (0, a) and the directrix is $y = -p$.
The distance from the origin to the focus = the distance from the origin to the directrix. The distance, d, from point (x,y) to the focus is the same as its perpendicular distance, d, to the directrix.

1. Represent the distance, d, from (x,y) to the focus in terms of x, y and p. (*Hint*: use the triangle).

2. Represent the distance, d, from (x,y) to the directrix in terms of y and p.

3. Set the separate equations for d equal to one another.

4. Square both sides and simplify.