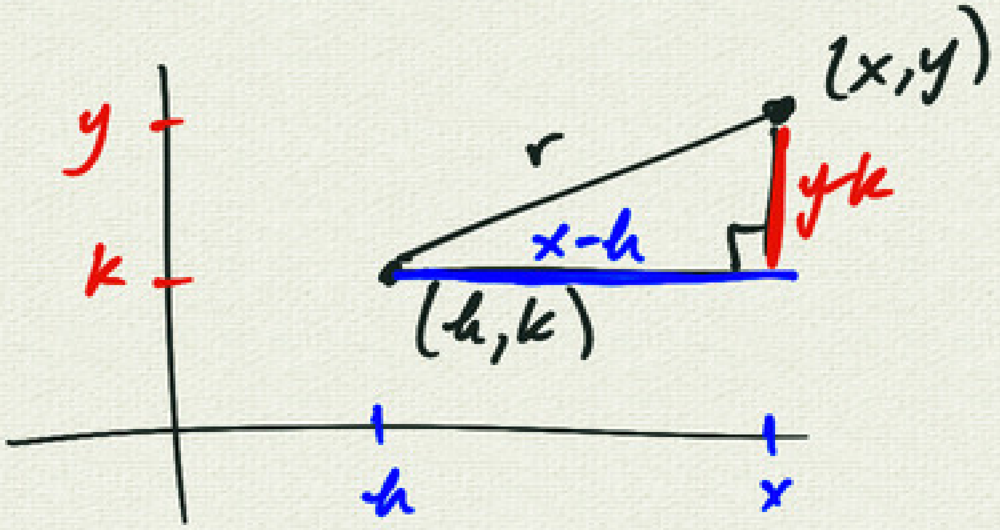
5.1 Parabolas

circle:

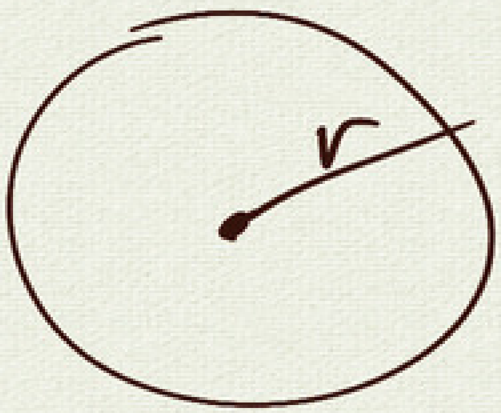
$$(x-h)^2 + (y-k)^2 = r^2$$

algebraic definition



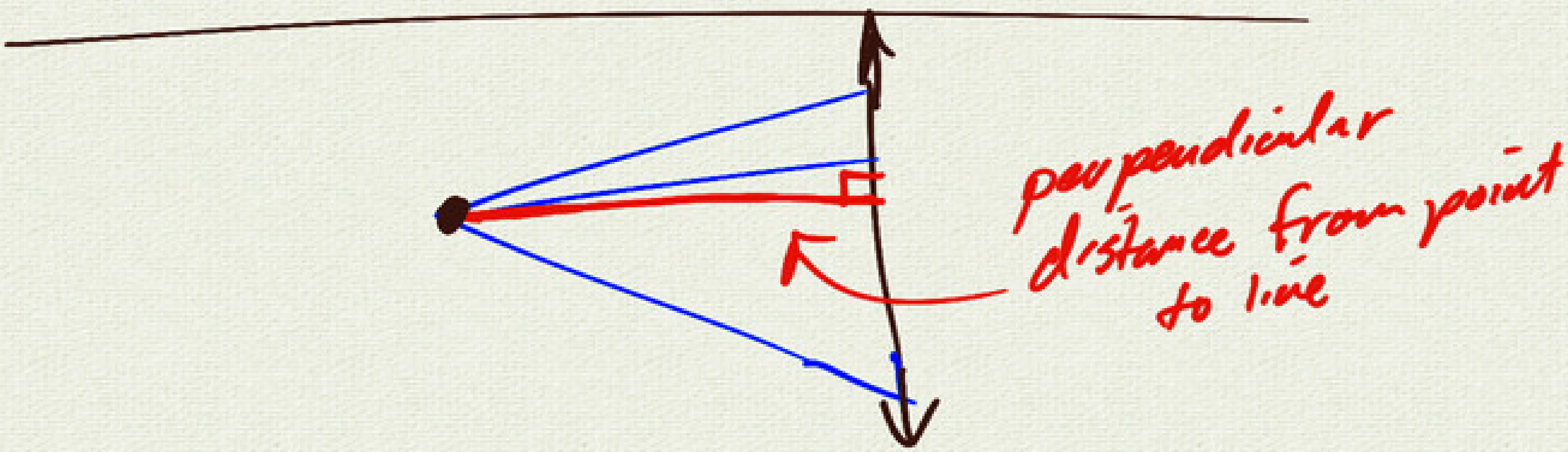
$$r = \sqrt{(x-h)^2+(y-k)^2}$$

$$r^2 = (x-h)^2+(y-k)^2$$



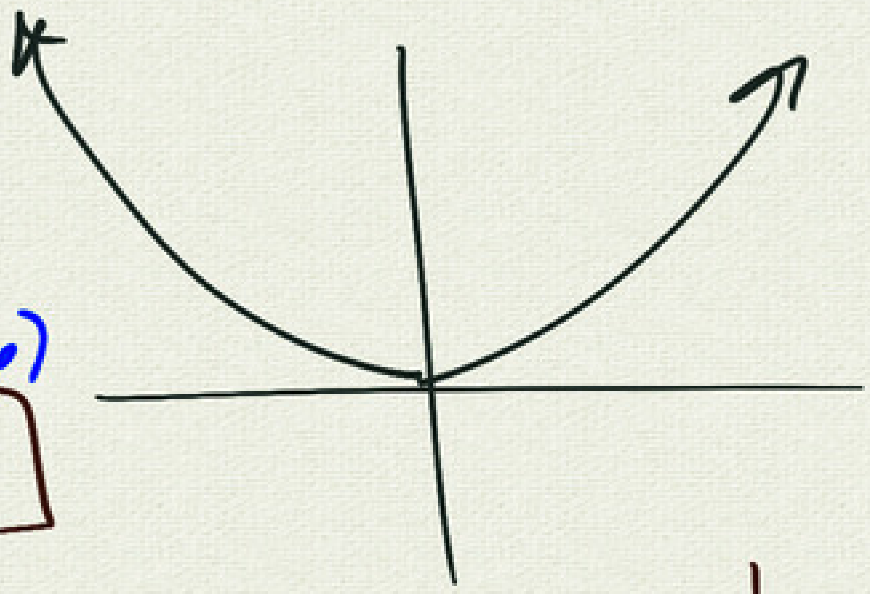
geometric definition:

a circle is the set of points equidistant from a center point



parabola:

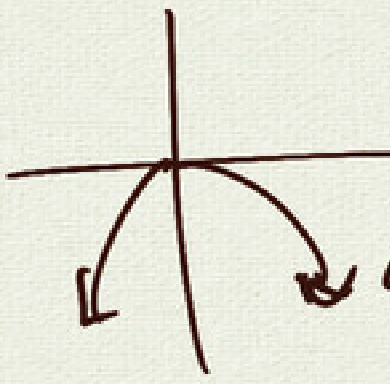
$y = x^2$

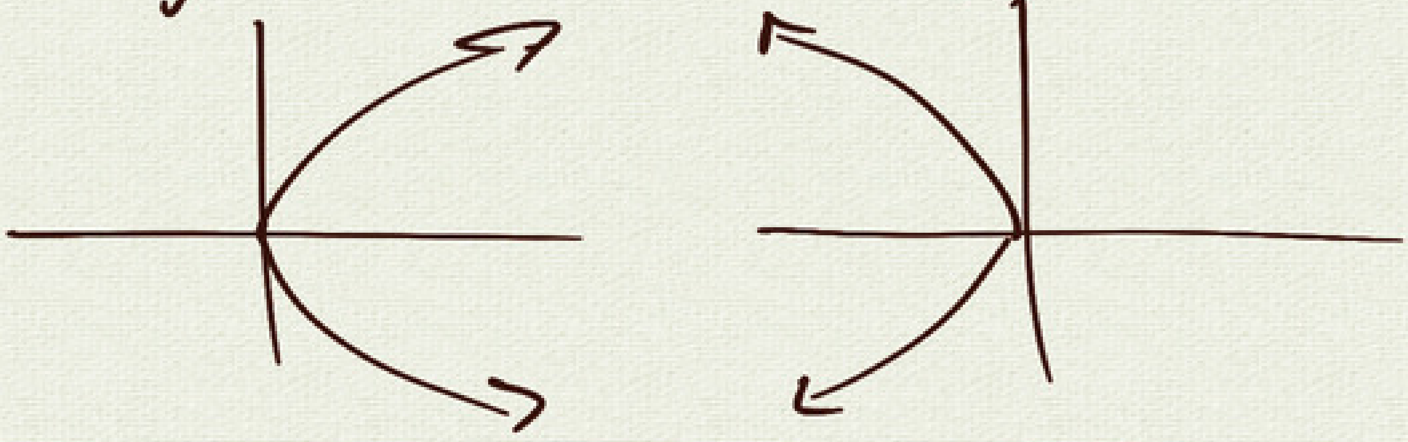


scale (flip)

$$\boxed{y-k = a(x-h)^2}$$

shift (or center)





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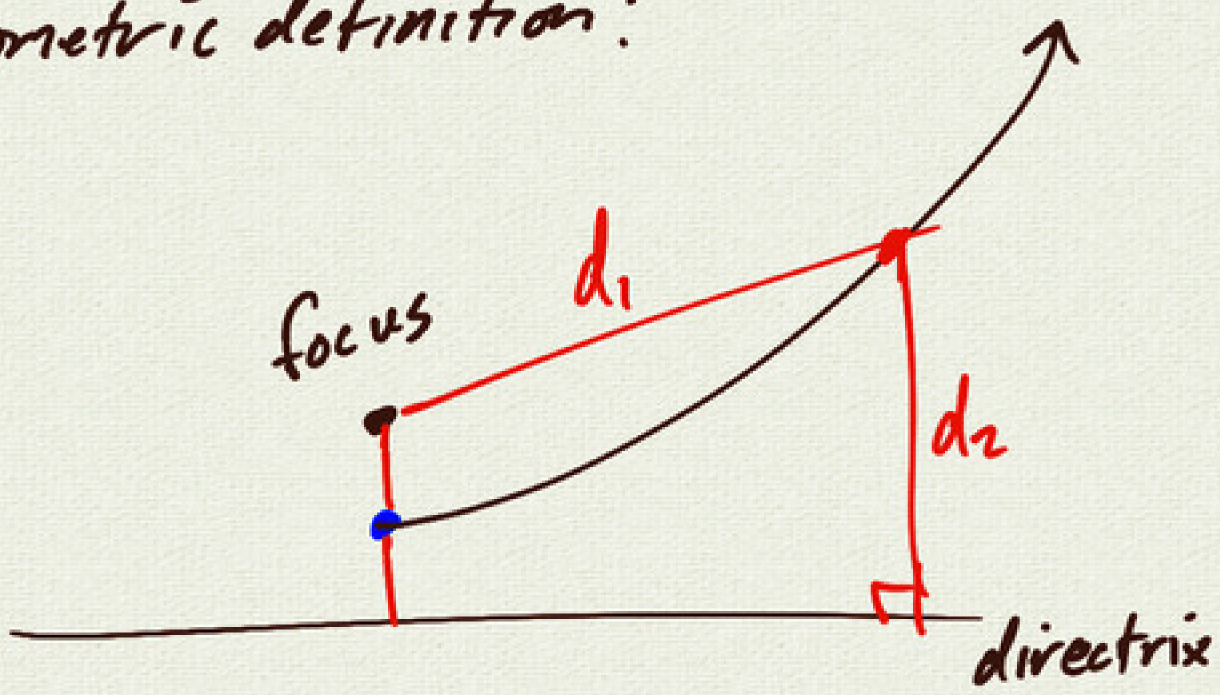
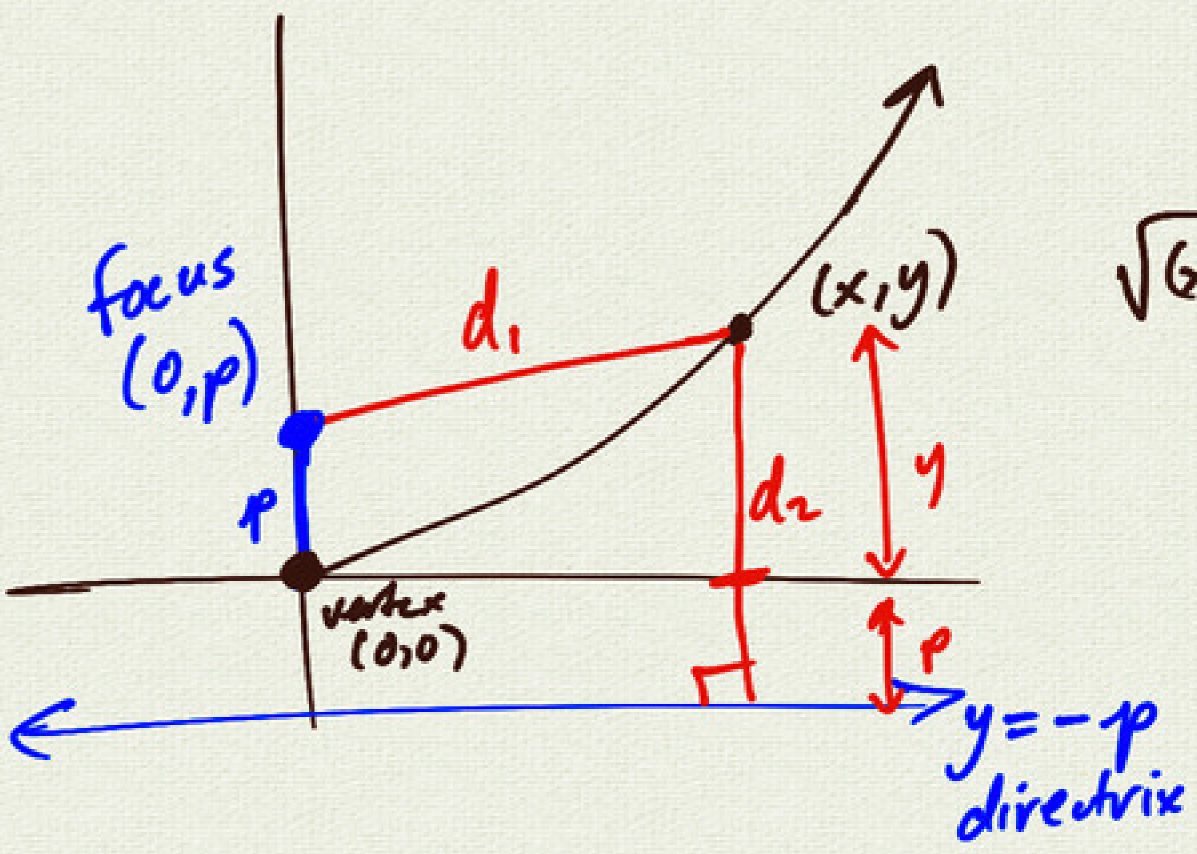
geometric definition:



$d_1 = d_2$



$$d_1 = d_2$$

$$\sqrt{(x-0)^2+(y-p)^2} = y+p$$

$$x^2 + (y-p)^2 = (y+p)^2$$

$$x^2 + (y^2 - 2py + p^2) = (y^2 + 2py + p^2)$$

$$x^2 = 4py$$

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

example:

focus $(4\frac{1}{16}, 3)$

directrix $x = 4 - \frac{1}{16}$

find equation

"$x = y^2$"

vertex $(4,3)$

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

$p = \frac{1}{16}$ (distance from vertex to focus)

$$\longrightarrow \quad x - 4 = 4(y-3)^2$$