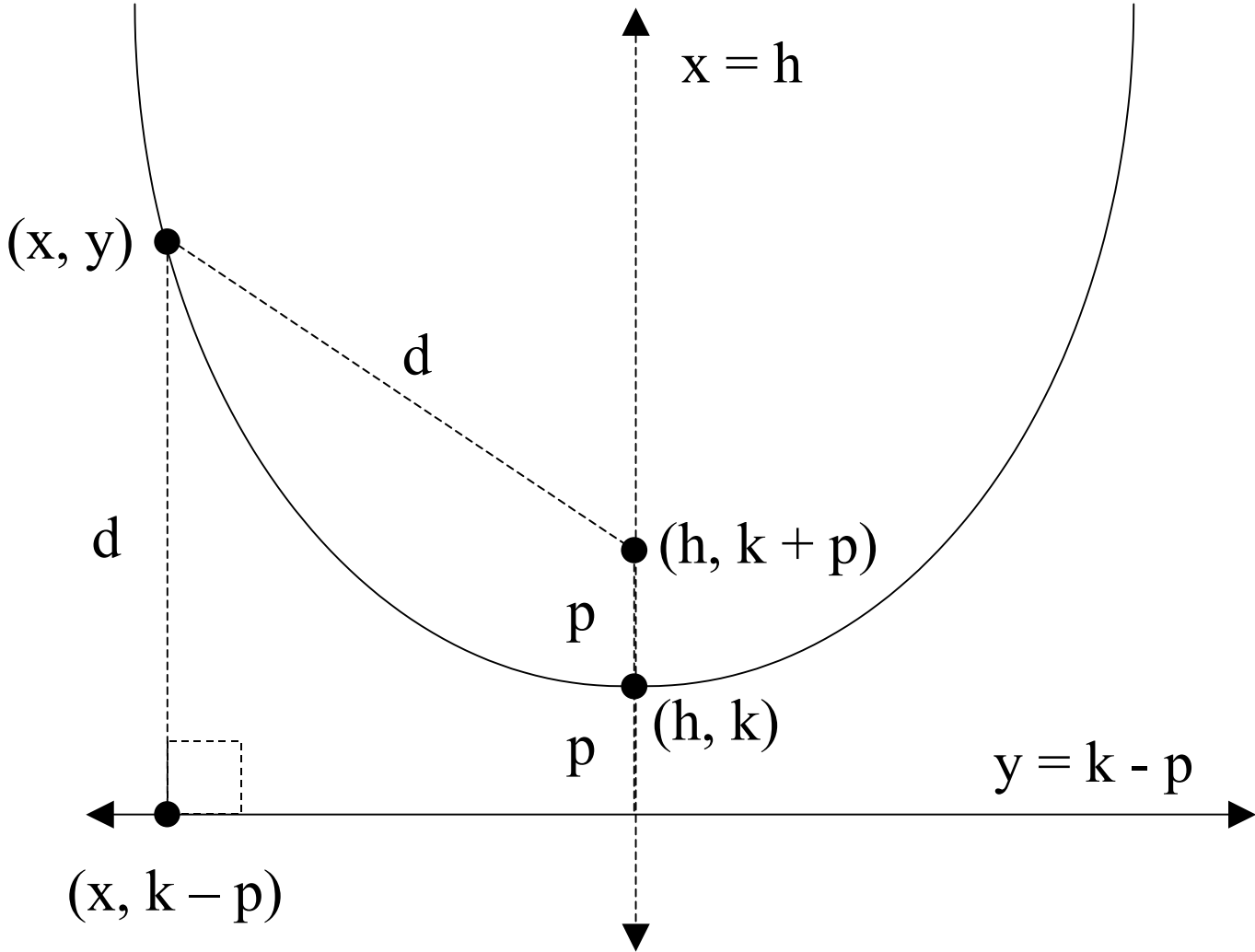


Standard Parabolic Form of a parabola that opens up.



Deriving Standard Parabolic Form of the up parabola

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

$$\left(\sqrt{(x-h)^2 + [y-(k+p)]^2}\right)^2 = \left(\sqrt{(x-x)^2 + [y-(k-p)]^2}\right)^2$$

$$(x-h)^2 + [y-(k+p)]^2 = (x-x)^2 + [y-(k-p)]^2$$

$$(x-h)^2 + (y-k-p)^2 = (0)^2 + (y-k+p)^2$$

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

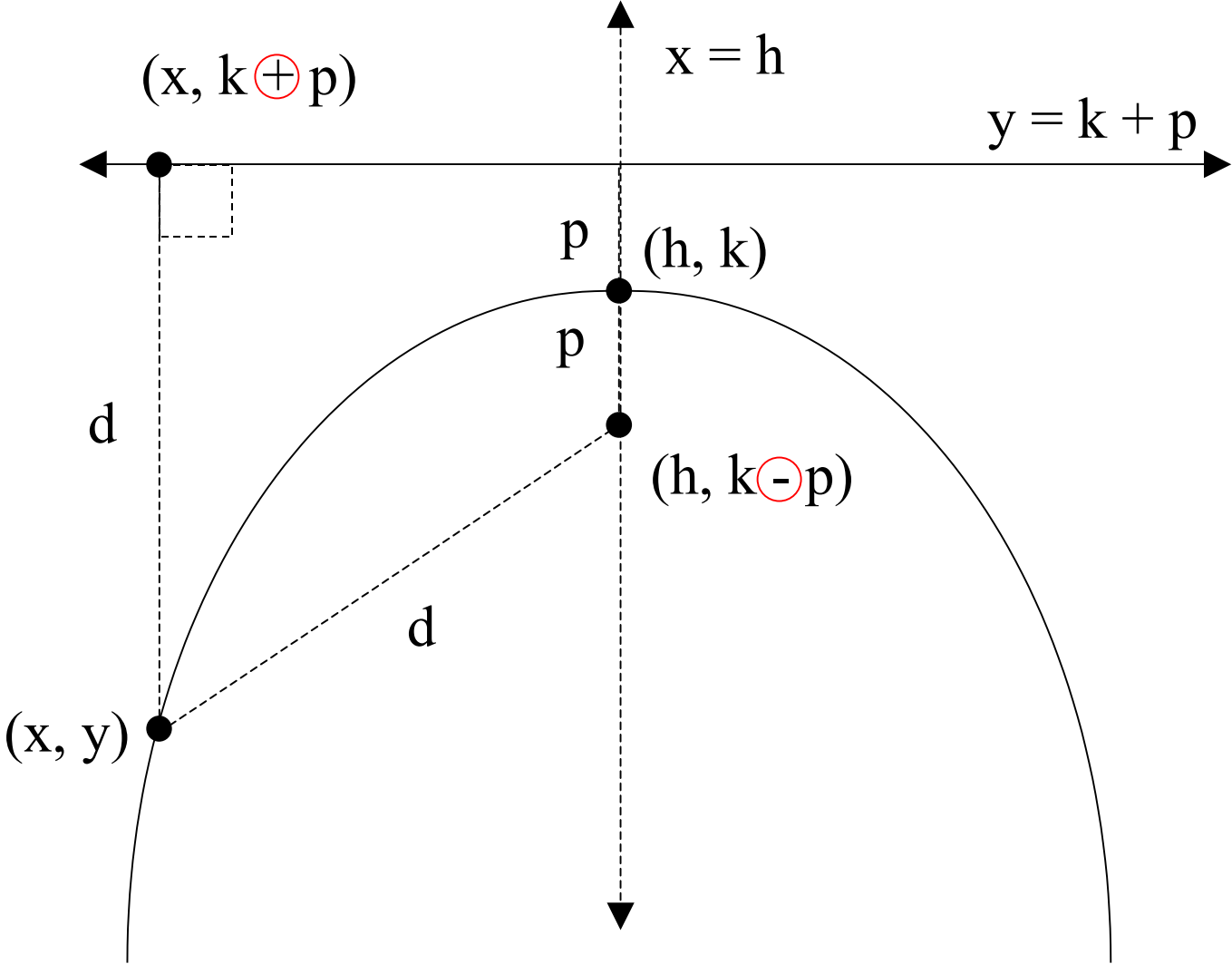
$$(x-h)^2 + (y^2 - 2yk - 2yp + 2kp + k^2 + p^2) = (y^2 - 2yk + 2yp - 2kp + k^2 + p^2)$$

$$(x-h)^2 + (-2yp + 2kp) = (2yp - 2kp)$$

$$(x-h)^2 = (4yp - 4kp)$$

$$(x-h)^2 = 4p(y-k)$$

Standard Parabolic Form of a parabola that opens down



Deriving Standard Parabolic Form for the down parabola

$$\sqrt{(x-h)^2 + [y-(k\ominus p)]^2} = \sqrt{(x-x)^2 + [y-(k\oplus p)]^2}$$

$$\left(\sqrt{(x-h)^2 + [y-(k\ominus p)]^2}\right)^2 = \left(\sqrt{(x-x)^2 + [y-(k\oplus p)]^2}\right)^2$$

$$(x-h)^2 + [y-(k\ominus p)]^2 = (x-x)^2 + [y-(k\oplus p)]^2$$

$$(x-h)^2 + (y-k\oplus p)^2 = (0)^2 + (y-k\ominus p)^2$$

$$(x-h)^2 + (y-k\oplus p)(y-k\oplus p) = (y-k\ominus p)(y-k\ominus p)$$

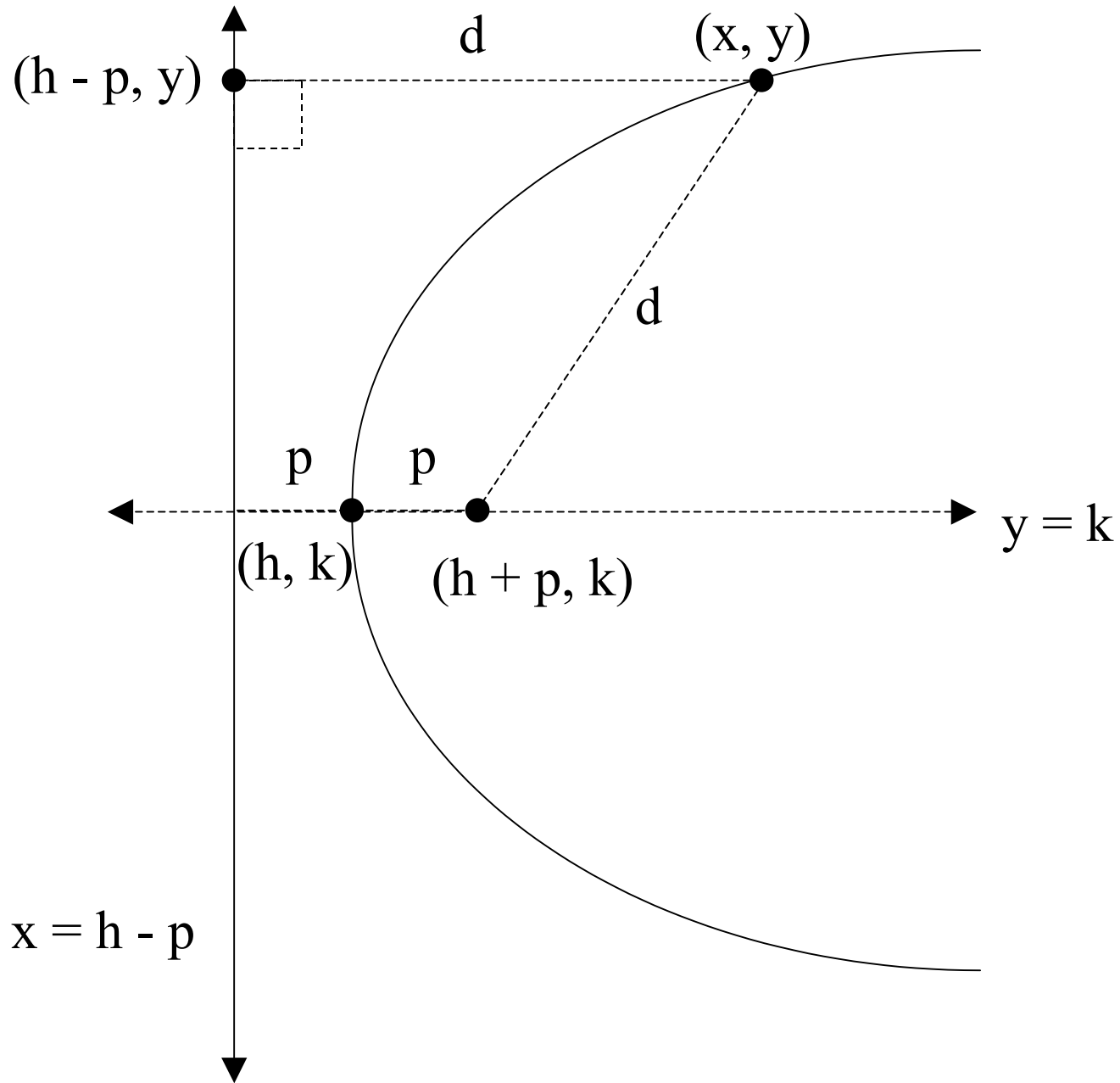
$$(x-h)^2 + (y^2 - 2yk\oplus 2yp - 2kp\oplus k^2 + p^2) = (y^2 - 2yk\ominus 2yp + 2kp\oplus k^2 + p^2)$$

$$(x-h)^2 + (2yp\ominus 2kp) = (\ominus 2yp\oplus 2kp)$$

$$(x-h)^2 = (\ominus 4yp\oplus 4kp)$$

$$(x-h)^2 = \ominus 4p(y-k)$$

Standard Parabolic Form of a parabola that opens right.



Deriving Standard Parabolic Form of the right parabola

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

$$\left(\sqrt{[x - (h + p)]^2 + (y - k)^2}\right)^2 = \left(\sqrt{[x - (h - p)]^2 + (y - y)^2}\right)^2$$

$$[x - (h + p)]^2 + (y - k)^2 = [x - (h - p)]^2 + (y - y)^2$$

$$[x - (h + p)]^2 + (y - k)^2 = [x - (h - p)]^2 + 0^2$$

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

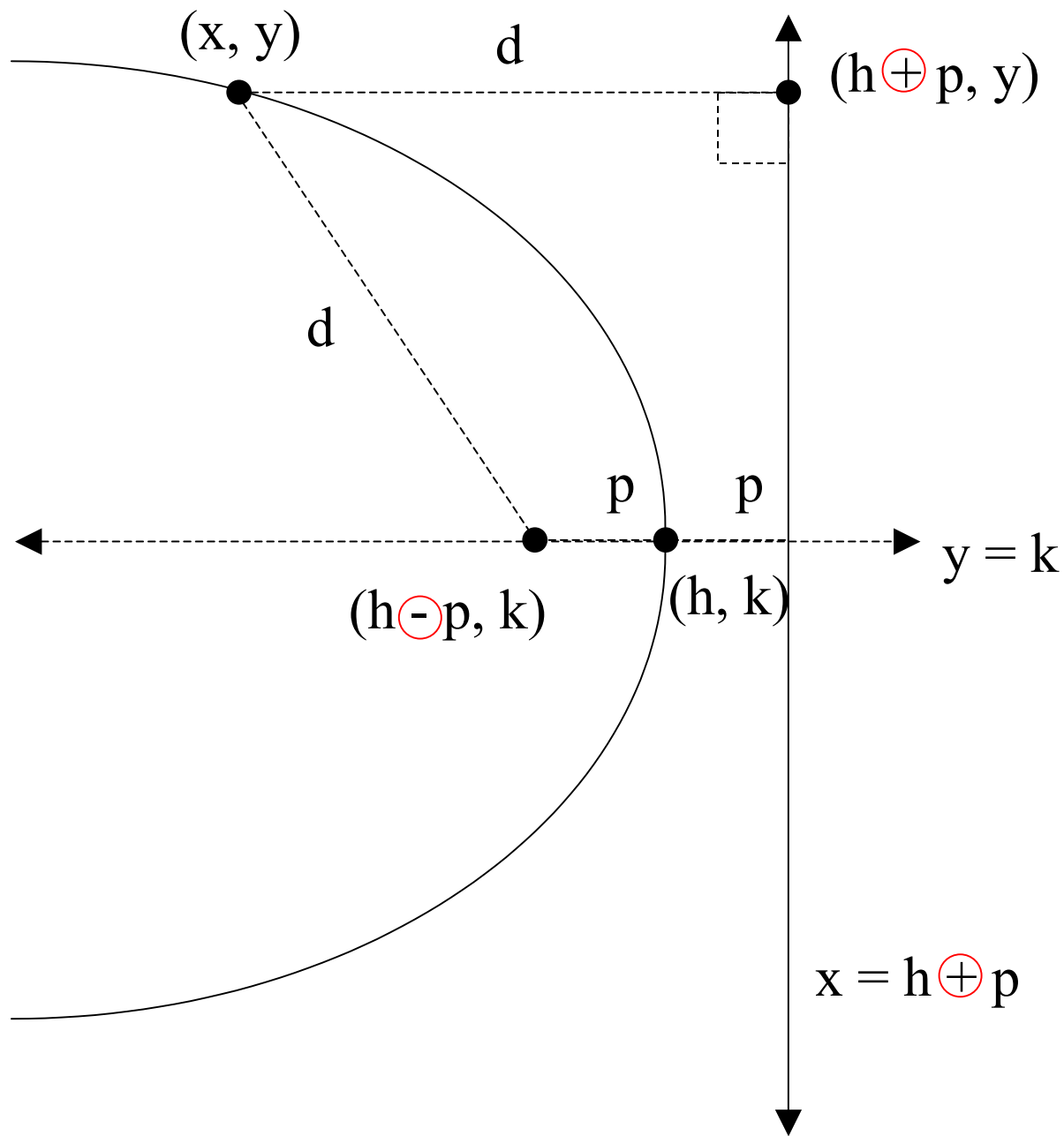
$$x^2 - 2xh - 2xp + 2hp + h^2 + p^2 + (y - k)^2 = x^2 - 2xh + 2xp - 2hp + h^2 + p^2$$

$$(y - k)^2 + (-2xp + 2hp) = 2xp - 2hp$$

$$(y - k)^2 = (4xp - 4hp)$$

$$(y - k)^2 = 4p(x - h)$$

Standard Parabolic Form of a parabola that opens left.



Deriving Standard Parabolic Form of the left parabola

$$\sqrt{[x - (h \ominus p)]^2 + (y - k)^2} = \sqrt{[x - (h \oplus p)]^2 + (y - y)^2}$$

$$\left(\sqrt{[x - (h \ominus p)]^2 + (y - k)^2}\right)^2 = \left(\sqrt{[x - (h \oplus p)]^2 + (y - y)^2}\right)^2$$

$$[x - (h \ominus p)]^2 + (y - k)^2 = [x - (h \oplus p)]^2 + (y - y)^2$$

$$[x - (h \ominus p)]^2 + (y - k)^2 = [x - (h \oplus p)]^2 + 0^2$$

$$(x - h \oplus p)(x - h \oplus p) + (y - k)^2 = (x - h \ominus p)(x - h \ominus p)$$

$$x^2 - 2xh \oplus 2xp \ominus 2hp + h^2 + p^2 + (y - k)^2 = x^2 - 2xh \ominus 2xp \oplus 2hp + h^2 + p^2$$

$$(y - k)^2 + (2xp \ominus 2hp) = \ominus 2xp \oplus 2hp$$

$$(y - k)^2 = (\ominus 4xp \oplus 4hp)$$

$$(y - k)^2 = \ominus 4p(x - h)$$