4.3 *Quadratic Functions in Vertex Form $y = a(x-p)^2 + q$ *

Ex 1 Graph $y - \frac{1}{4} = -(4+x)^2 + \frac{7}{4}$

$+\frac{1}{4}$ $\qquad$ $+\frac{1}{4}$

Sol'n Tip: Rearrange to vertex form.

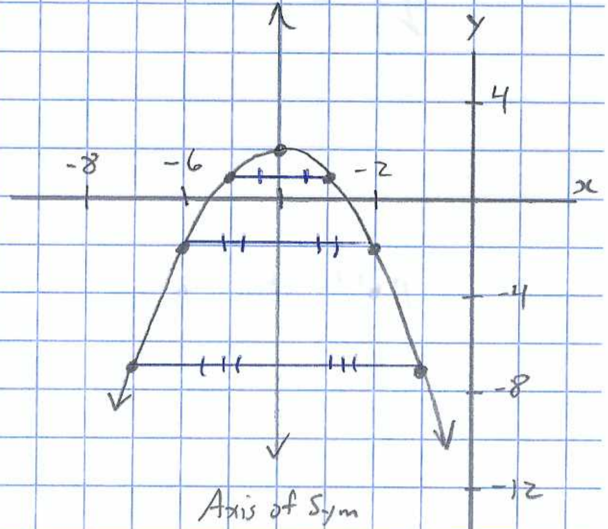
$$y = -(x+4)^2 + \frac{8}{4}$$

$$y = -(x+4)^2 + 2$$

1. $V(-4, 2)$
2. Mini Table of Easy Points. "Sub and Solve"

x	y
-5	1
-6	-2
-7	-7

3. Use symmetry.



Axis of Sym
$x = -4$

Ex 2 Write an equation for the parabola with vertex (2,3) and an "a" value of -4.

Sol'n $y = a(x-p)^2 + q$ $\qquad$ $\therefore \; y = -4(x-2)^2 + 3$ ✓✓✓

$a = -4$, given
$p = 2$, x coordinate of $V(2,3)$
$q = 3$, y coordinate of $V(2,3)$

Ex 3 Write the equation of the parabola with a maximum point of (-1,-5) and congruent to parabola $y = 3x^2 - 2020$

Sol'n For maximum points, parabolas open down. So "a" is negative

$a = 3$, New parabola has same shape and size as $y = 3x^2 - 2020$, so has same stretch factor.

$\left.\begin{array}{l} p = -1 \\ q = -5 \end{array}\right\}$ From vertex (-1,-5) which is the high tip.

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

$\therefore \; y = -3(x-(-1))^2 + -5$

$y = -3(x+1)^2 - 5$, tidy up double signs. ✓✓✓

e)

Ex 4 Write equation of the parabola with vertex $(0, -2)$ and $\underbrace{\text{vertical stretch factor}}_{=a}$ of 10.

Soln

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

$a = 10$
$p = 0$
$q = -2$

$y = 10(x-(0))^2 + (-2)$, sub in

$y = 10(x)^2 - 2$, tidy up signage

$y = 10x^2 - 2$, tidy up.

p 214 #10
p 224 #9, 10, 19, 20