

QUADRATIC FUNCTIONS

3

STANDARD FORM

$$f(x) = a(x-h)^2 + k$$

VERTEX: (h, k)

AXIS OF SYMMETRY (A.O.S.): $x = h$

MIN/MAX: k

a IS POSITIVE: \curvearrowright

a IS NEGATIVE: \curvearrowleft

$$f(x) = -5(x-3)^2 + 7$$

\downarrow opp sign \downarrow same sign
 $h=3$ $k=7$

VERTEX: $(3, 7)$
 h k

4

$$f(x) = (x-4)^2 + 1$$

\downarrow \downarrow \downarrow
 $a=1$ $h=4$ $k=1$

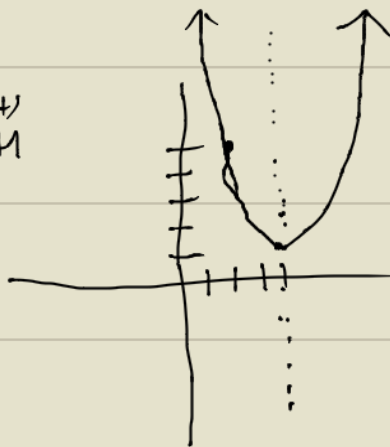
\cup
MIN

VERTEX = (h, k)
 $= (4, 1)$

A.O.S.: $x = h$
 $x = 4$

MIN: 1

$$\begin{aligned} x &= 2 \\ y &= (2-4)^2 + 1 \\ &= (-2)^2 + 1 \\ &= 4 + 1 \\ &= 5 \end{aligned}$$



Form: $f(x) = ax^2 + bx + c$

a IS POS: \cup VERTEX: $(\frac{-b}{2a}, f(\frac{-b}{2a}))$

a IS NEG: \cap

A.O.S.: $x = \frac{-b}{2a}$

MIN/MAX: $f(\frac{-b}{2a})$

5 $f(x) = -3x^2 + 12x - 1$

FIND VERTEX VIA VERTEX FORMULA

① IDENTIFY a AND b

$$a = -3 \quad b = 12$$

② PLUG THESE VALUES INTO

$\frac{-b}{2a}$ AND SIMPLIFY:

$$\frac{-b}{2a} = \frac{-12}{2(-3)} = \frac{-12}{-6} = 2 \quad \left. \vphantom{\frac{-b}{2a}} \right\} \text{X PART OF VERTEX}$$

③ NOW PLUG THIS VALUE BACK INTO ORIG FUNCTION AND SIMPLIFY

$$f(2) = -3(2)^2 + 12(2) - 1$$

$$= -3(4) + 24 - 1$$

$$= -12 + 24 - 1$$

$$= 12 - 1$$

$$= 11$$

$\left. \vphantom{11} \right\} \text{Y PART OF VERTEX}$

VERTEX
 $(2, 11)$