

Lesson Vocabulary
Vertex Form of a Quadratic

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



- $(h, k)$  is the coordinate of the vertex point. (min/max)
  - 'a' determines the direction of the parabola.
    - a is positive - opens up  $\uparrow\uparrow$  (min)
    - a is negative - opens down  $\downarrow\downarrow$  (max)
  - $-a > 1$ , skinny  $0 < a < 1$
  - to find y-int, plug zero in for x and solve
  - x-int:  $x = h \pm \sqrt{\frac{-k}{a}}$  (or use calc - zeros)
- ★ why is the x-int a  $\pm$ ?

★ Use Symmetry from vertex point and y-int, if there are no x-int.

Write Vertex Form from a graph:  $y = a(x-h)^2 + k$

1. Plug in vertex point  $(h, k)$
2. Plug in  $(x, y)$  from any other good point, (y-int)
3. Solve for a.
4. plug  $(h, k)$  and a into vertex form

Write in Standard Form:  $ax^2 + bx + c$

1. Use distributive for  $(x-h)^2$
2. Simplify.

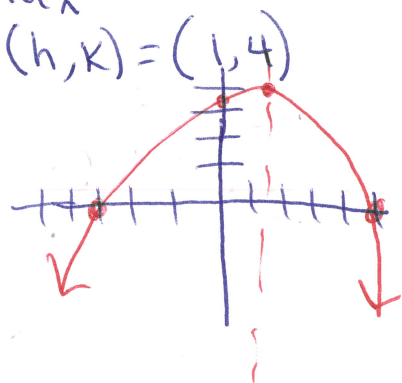
Example Problem(s)

ex.) Determine if the graph opens up/down, has a min/max, the x- and y-int. Then graph.

$$f(x) = -\frac{1}{4}(x-1)^2 + 4$$

opens down  
max

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



$$y\text{-int: } y = -\frac{1}{4}(0-1)^2 + 4$$

$$y = -\frac{1}{4}(-1)^2 + 4$$

$$y = -\frac{1}{4} + 4 = 3.75$$

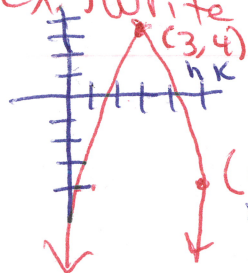
$$(0, 3.75)$$

$$x\text{-int: } x = h \pm \sqrt{\frac{-k}{a}}$$

$$x = 1 \pm \sqrt{\frac{-4}{-\frac{1}{4}}} = 1 \pm \sqrt{16}$$

$$x = 1 \pm 4 \quad (5,0) \\ (-3,0)$$

ex.) Write in Vertex Form.



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

$$-4 = a(5-3)^2 + 4$$

$$-4 = 4a + 4$$

$$-8 = 4a$$

$$-2 = a$$

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

$$y = -2(x-3)^2 + 4$$

★ how can you check?

ex.) Write in standard form,  $y = 3(2x+1)^2 - 5$

$$y = 3(2x+1)(2x+1) - 5$$

$$y = 3(4x^2 + 4x + 1) - 5$$

$$y = 12x^2 + 12x + 3 - 5$$

$$y = 12x^2 + 12x - 2$$

★ How can you check?