

13.1 Parabolas and Circles

Quadratics often come in "stretched out" (general form) and "useful" (vertex) form

Parabolas (vertical)

General form: $y = ax^2 + bx + c$

Vertex form: $y = a(x - h)^2 + k$
or $(y - k) = a(x - h)^2$

Parabolas (horizontal)

General: $x = ay^2 + by + c$

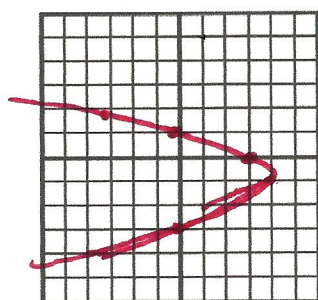
Vertex: $x = a(y - k)^2 + k$
or $(x - h) = a(y - k)^2$

Graphing Procedure (from Chapter 11)

1. Decide direction of opening
2. Find vertex
3. Plot another point to find width

face left

Ex a Graph $x = -y^2 - 2y + 3$ Which way does it face? $y^2 \rightarrow$ horizontal; $\downarrow y^2$



Invert (switch x & y) the vertex formula

$$y = \frac{-b}{2a} = \frac{-(-2)}{2(-1)} = 1$$

$$\text{plug in } y \Rightarrow x = -(-1)^2 - 2(-1) + 3 = -1 + 2 + 3 = 4 \Rightarrow (4, -1) \text{ (vertex)}$$

Another point: let y=0, x=0+0+3 \Rightarrow (3, 0)

$$\text{let } x=0: -(y^2 + 2y - 3) = 0$$

$$-(y+3)(y-1) = 0; y = -3, 1 \Rightarrow (6, -3) (0, 1)$$

Bonus material in videos (skip if you like): Vertex form can be written with the coefficient

"a" = $\frac{1}{4p}$, so the vertex forms look like

$$4p(y - k) = (x - h)^2 \text{ (vertical parabola) or}$$

$$4p(x - h) = (y - k)^2 \text{ (horizontal parabola)}$$

The value "p" is significant – it's the distance from the vertex to the focus of the parabola.

Ex 1-bonus: For the equation $x^2 + 8x = 4y - 8$, write in standard form. Find the vertex, focus and graph

(see video at

https://www.youtube.com/watch?v=CKepZr52G6Y&ab_channel=Mathispower4u

