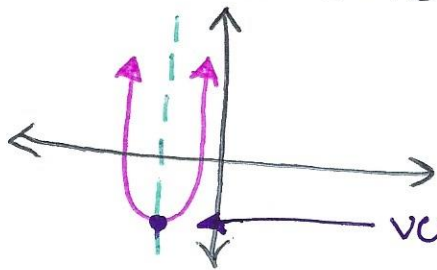


Section 2.1 Quadratics

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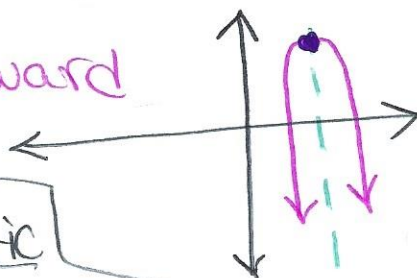
- Standard form: $F(x) = ax^2 + bx + c$



opens upward, $a > 0$
axis of symmetry

vertex: point where the graph intersects the axis of symmetry.

opens downward
 $a < 0$



Vertex form of a quadratic

$$F(x) = a(x-h)^2 + k \quad (h, k) \text{ vertex}$$

Standard \rightarrow vertex form
complete the square

ex $f(x) = x^2 - 8x + 7$

$$x^2 - 8x + 16 - 16 + 7$$

$$\frac{-8}{2} = -4 \rightarrow (-4)^2 = 16$$

$$x^2 - 8x + 16 - 16 + 7$$

$$f(x) = (x-4)^2 - 9$$

Graph it

vertex: $(4, -9)$

$a = 1$ opens up

axis of symmetry is $x = 4$

x-intercept

$$y = 0 \quad 0 = (x-4)^2 - 9$$

$$9 = (x-4)^2 \rightarrow \sqrt{9} = x-4 \rightarrow \pm 3 = x-4 \rightarrow \begin{cases} 4+3 = x \\ x=7 \\ x=1 \end{cases}$$

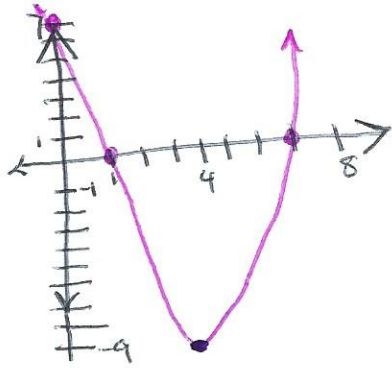
y-intercept

$$x=0 \quad y = (0-4)^2 - 9$$

$$y = (-4)^2 - 9$$

$$y = 16 - 9$$

$$y = 7 \quad (0, 7)$$



Domain: $(-\infty, \infty)$
Range: $[-25, \infty)$

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ex 2) Standard to vertex form: $a(x-h)^2 + k$

$$F(x) = 2x^2 + 12x - 7$$

$$2(x^2 + 6x) - 7$$

$$2(x^2 + 6x + 9) - 7 - 18 \rightarrow 2(x+3)^2 - 25$$

$$\frac{b}{2} = 3 \rightarrow 3^2 = 9$$

$$\text{vertex: } (-3, -25)$$

$$a = 2$$

$$\text{axis of symmetry} \Rightarrow x = -3$$

- x value of vertex when/where the min or max occurs
- y value of the vertex gives the min or max value.

Formula for vertex: $h = \frac{-b}{2a}$ $k = f(h)$

ex) $F(x) = 2x^2 + 12x - 7$

$$h = \frac{-12}{2(2)} = \frac{-12}{4} = -3$$

$$k = 2(-3)^2 + 12(-3) - 7 = -25$$

$$\text{vertex: } (-3, -25)$$