Graphing Quadratics from Standard Form

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

Fact: The graph of every quadratic has the shape of a parabola.

Better Fact: We can use the standard form of a quadratic to find all the information we need to graph the corresponding parabola.

Steps to Graphing a Quadratic Function from the Standard Form

1. Determine whether the graph opens up ($a > 0$) or down ($a < 0$).

2. Find the vertex and the equation of the axis of symmetry.

   The vertex is found at $x = \frac{-b}{2a}$ and the equation of the axis of symmetry is the same.

3. Find the vertical intercept. (This is when input is 0, so vertical intercept is $(0, c)$)

4. Find the horizontal intercepts, if any. (These are found by solving $ax^2 + bx + c = 0$)

5. Plot the points you found in steps 2 through 4. Plot their symmetric points and sketch the graph. (Find an additional pair of symmetric points if needed.) → double vertex ×
   use same c

Examples: Sketch the graph of the following.

1. $f(x) = 1.5x^2 - 9x + 7.5$

$a = 1.5$ $b = -9$ $c = 7.5$

opens up ∪

vertex $x = -\frac{b}{2a} = -\frac{(-9)}{2(1.5)} = \frac{9}{3} = 3$

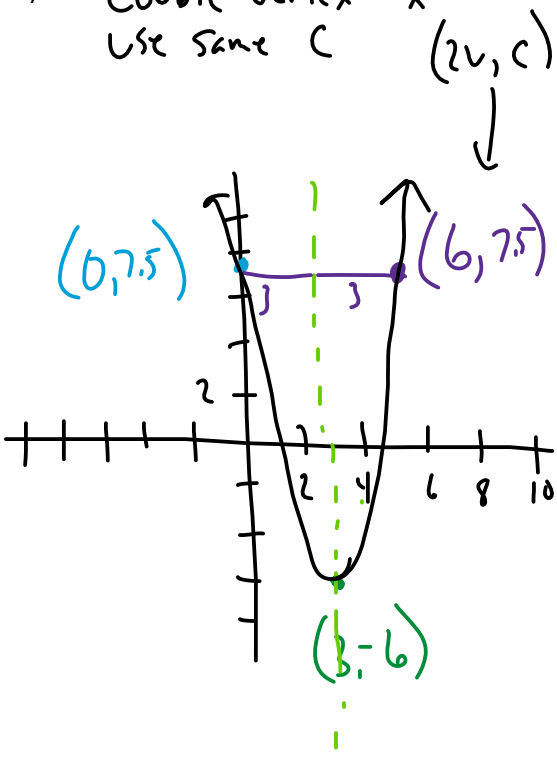
green $(3, -6)$

axis of sym. $x = 3$ H. green

$y = f(3) = 1.5(3)^2 - 9(3) + 7.5$
$= 1.5(9) - 27 + 7.5$
$= 13.5 - 27 + 7.5$
$= -13.5 + 7.5$
$= -6$

blue vert. int $(0, c) = (0, 7.5)$

horiz int $0 = 1.5x^2 - 9x + 7.5$!! eL



2. $f(x) = -0.25x^2 - 3x - 15$

$a = -0.25$ $b = -3$ $c = -15$

$a = -0.5$ so graph opens downward

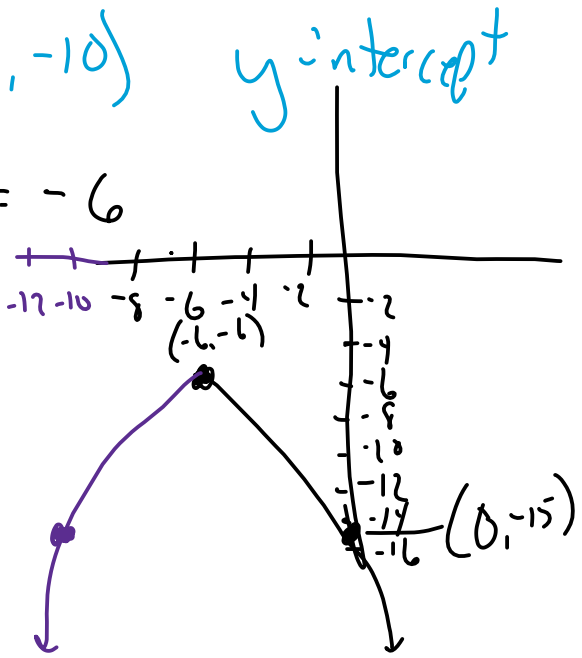
vertex $x = \frac{-b}{2a} = \frac{-(-3)}{2(-0.25)} = \frac{3}{-0.5} = -6$

$y = f(-6) = -6$

$(-6, -6)$

A.O.S. $x = -6$

$(0, -10)$ y-intercept



vertical intercept $(0, -15)$

Symmetric to vertical intercept

$(-12, -15)$

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

$a = 2$ $b = -12$ $c = 5$

up

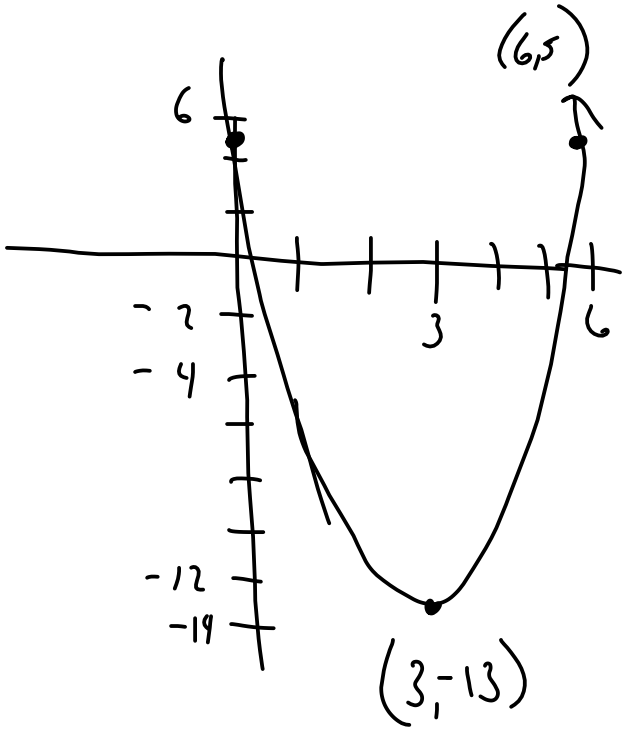
$(0, 5)$ y-int

vertex $x = \frac{-b}{2a} = \frac{-(-12)}{2(2)} = \frac{12}{4} = 3$

$y = 18 - 36 + 5 = -13$

$(3, -13)$

A.O.S. $x = 3$



$0 = 2x^2 - 12x + 5$ try

$(2x - 1)(x - 5)$

discriminant $b^2 - 4ac = 144 - 4(2)(5)$

$= 144 - 40 = 104$ exact integers

4. $f(x) = -0.5x^2 + 4x - 10$

vertex $x = \frac{-b}{2a} = \frac{-(4)}{2(-0.5)} = \frac{-4}{-1} = 4$ $(4, -2)$

$y = -.5(4)^2 + 4(4) - 10 = -2$

A.O.S. $x = 4$ y-int $(0, -10)$

Symmetric $(8, -10)$