Max and min of a quadratic function.

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

Vertex (h, k)

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

$a > 0$, min $f = \boxed{k}$

$a < 0$, max $f = k$

E.g. $f(x) = \boxed{4}x^2 + 2x - 7$.

$h = -\frac{1}{4}$; $k = -\frac{29}{4}$.

Min $f(x) = -\frac{29}{4}$ it happens when $x = -\frac{1}{4}$

$\boxed{f(x) = -5x^2 + 2x - 5}$ Max $f(x) = -\frac{24}{5}$.

$h = \frac{1}{5}$; $k = -\frac{24}{5}$. $x = \frac{1}{5}$.

Range: $(-\infty, -\frac{24}{5}]$

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Domain and Range of a quadratic function.

$f(x) = ax^2 + bx + c$. Domain: $(-\infty, \infty)$

Range:

$a > 0$ (h, k) | $a < 0$ (h, k)

Range: $[k, \infty)$ | Range $(-\infty, k]$

E.g.: $f(x) = 4x^2 + 2x - 7$

$(-\frac{1}{4}, -\frac{29}{4})$

Range: $[-\frac{29}{4}, \infty)$

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x-intercept and y-intercept of a quadratic function

$f(x) = \boxed{ax^2 + bx + c.}$

y-intercept: Put $x = 0$. $f(0) = c$.

$(0, c)$

x-intercept: Put $f(x) = 0$

$\boxed{ax^2 + bx + c = 0}$

$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$; $x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$

$f(x) = x^2 - 5x - 6$.

(h, k)

$h = \boxed{\frac{+5}{2}}$; $k = f(+\frac{5}{2}) = (+\frac{5}{2})^2 - 5 \cdot (+\frac{5}{2}) - 6$ $-\frac{49}{4}$

$= \frac{25}{4} - \frac{25}{2} - 6 = \frac{25 - 50 - 24}{4} = \cancel{\frac{51}{4}}$

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Vertex $\boxed{(+\frac{5}{2}, -\frac{49}{4})}$

y-intercept: $f(x) = x^2 - 5x - 6$.

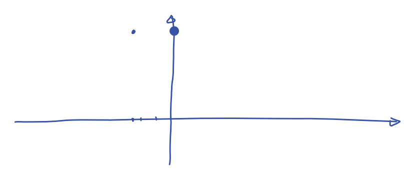
Put $x = 0$, $f(0) = -6$

$\boxed{(0, -6)}$

x-intercept(s): $x^2 - 5x - 6 = 0$ $\boxed{(6, 0)}$

$(x-6)(x+1) = 0$ $\boxed{(-1, 0)}$

$x = 6$; $x = -1$



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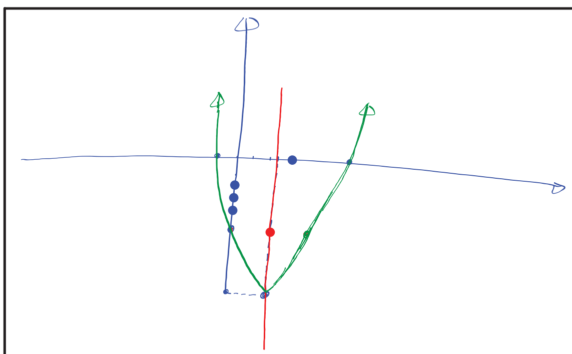

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Given a graph of a quadratic function, find the equation for the function.

Procedure:
1. Find vertex (h, k) from graph
2. Plug vertex into standard form $f(x) = a(x-h)^2 + k$
3. Pick a convenient point on graph. and use it to solve for a.
4. Expand the standard form to get the general form if necessary.

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