Intercepts of the Quadratic

Given a quadratic $v(p) = a\,p^2 + b\,p + c$ compute its discriminant $\triangle$:

$\triangle = \sqrt{b^2 - 4\,ac}$

Case1: $\triangle > 0$

$p_{1,2} = \frac{-b \pm \sqrt{b^2 - 4\,ac}}{2a}$ computes the p-intercepts of multiplicity 1.

$v(0) = c$ computes the single v-intercept.

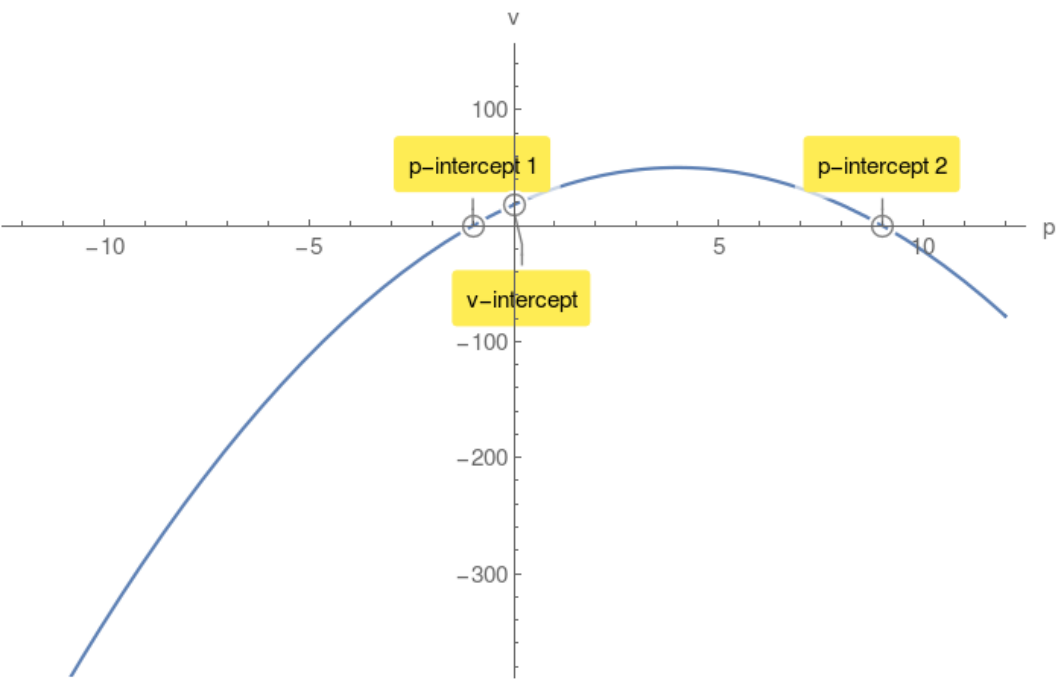
Example 1.

$v(p) = -2\,p^2 + 16\,p + 18$ compute its discriminant $\triangle$:

$\triangle = 400 > 0$

$p_{1,2} = -1, 9$

$v(0) = 18$ v-intercept.



Case2: $\triangle = 0$

$p_{1,2} = \frac{-b \pm \sqrt{b^2 - 4\,ac}}{2a} = \frac{-b \pm 0}{2a} = \frac{-b}{2a}$ single p-intercept of multiplicity 2.

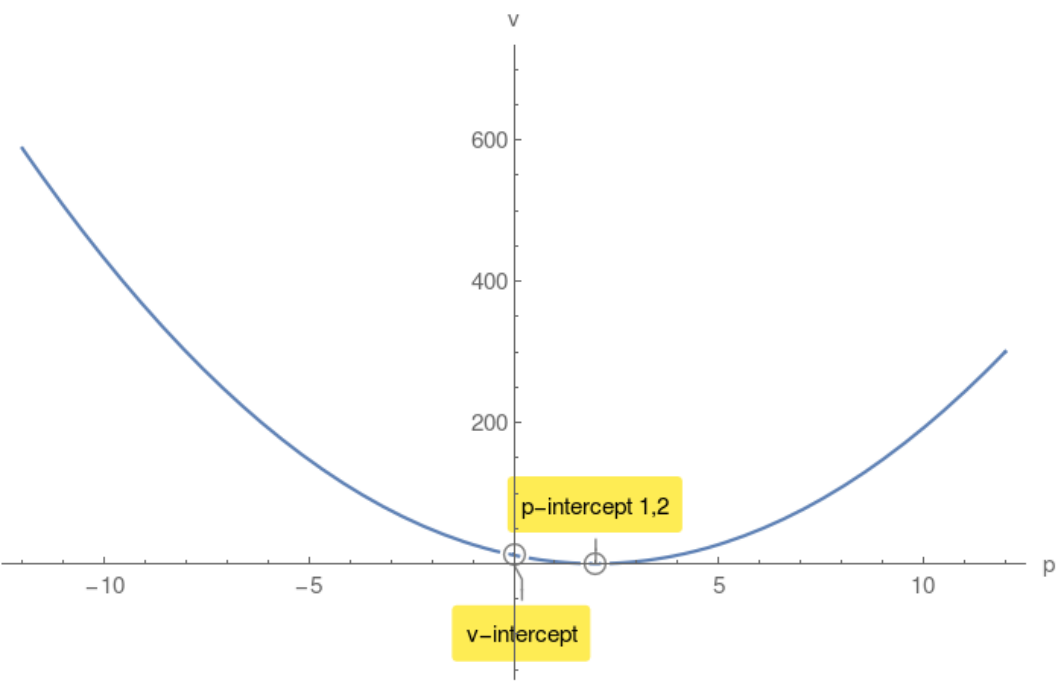
Example 2.

$v(p) = 3\,p^2 - 12\,p + 12$ compute its discriminant $\triangle$:

$\triangle = 0$

$p_{1,2} = 2, 2$

$v(0) = 12$ v-intercept.



Case3: $\triangle < 0$

$\sqrt{b^2 - 4\,ac}$ has no value in Real Numbers. Therefore there are no p-intercepts.

However there is a v-intercept.

Example 3.

$v(p) = -9\,p^2 + 144\,p - 640$ compute its discriminant $\triangle$:

$\triangle = -2304 < 0$

$v(0) = -640$ v-intercept.