Intercepts of the Quadratic

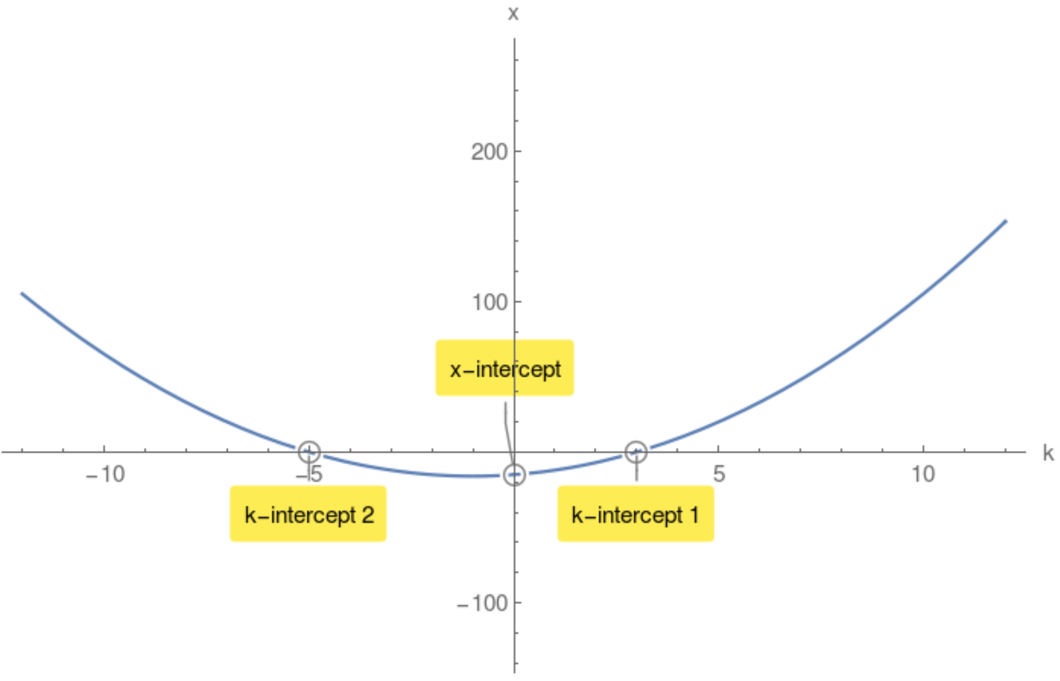
Given a quadratic $x(k) = a k^2 + b k + c$ compute its discriminant Δ:
$\Delta = \sqrt{b^2 - 4ac}$

Case1: $\Delta > 0$

$k_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ computes the k-intercepts of multiplicity 1.
$x(0) = c$ computes the single x-intercept.

Example 1.

$x(k) = k^2 + 2k - 15$ compute its discriminant Δ:
$\Delta = 64 > 0$
$k_{1,2} = 3, -5$
$x(0) = -15$ x-intercept.

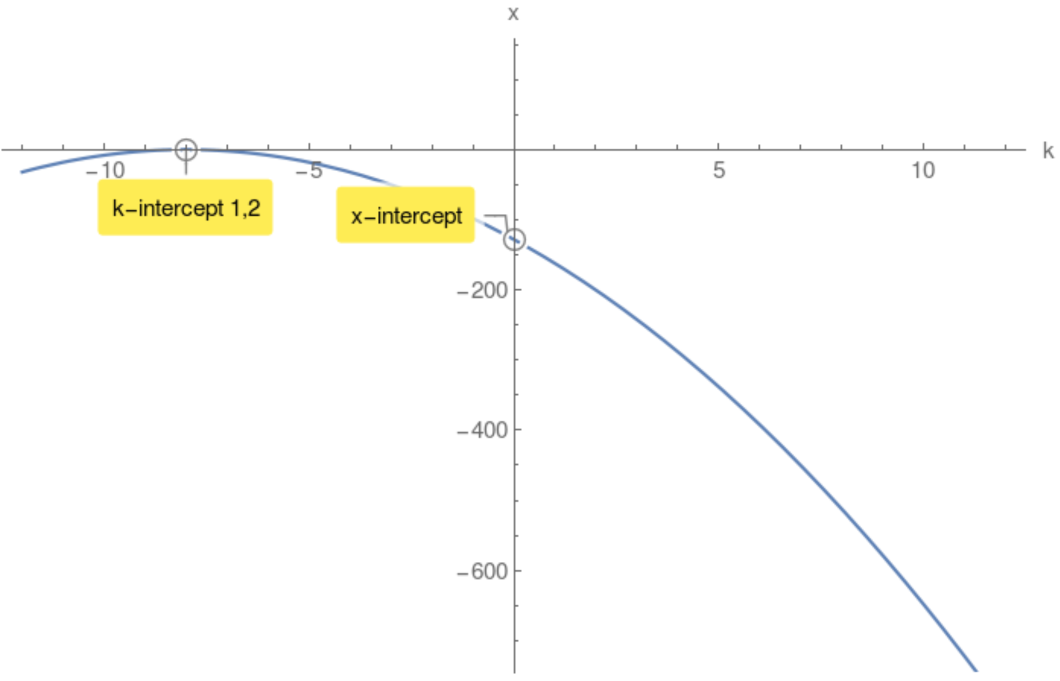


Case2: $\Delta = 0$

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

Example 2.

$x(k) = -2k^2 - 32k - 128$ compute its discriminant Δ:
$\Delta = 0$
$k_{1,2} = -8, -8$
$x(0) = -128$ x-intercept.



Case3: $\Delta < 0$

$\sqrt{b^2 - 4ac}$ has no value in Real Numbers. Therefore there are no k-intercepts.
However there is a x-intercept.

Example 3.

$x(k) = -9k^2 - 126k - 490$ compute its discriminant Δ:
$\Delta = -1764 < 0$
$x(0) = -490$ x-intercept.