Intercepts of the Quadratic

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

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

Case1: $\triangle>0$

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

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

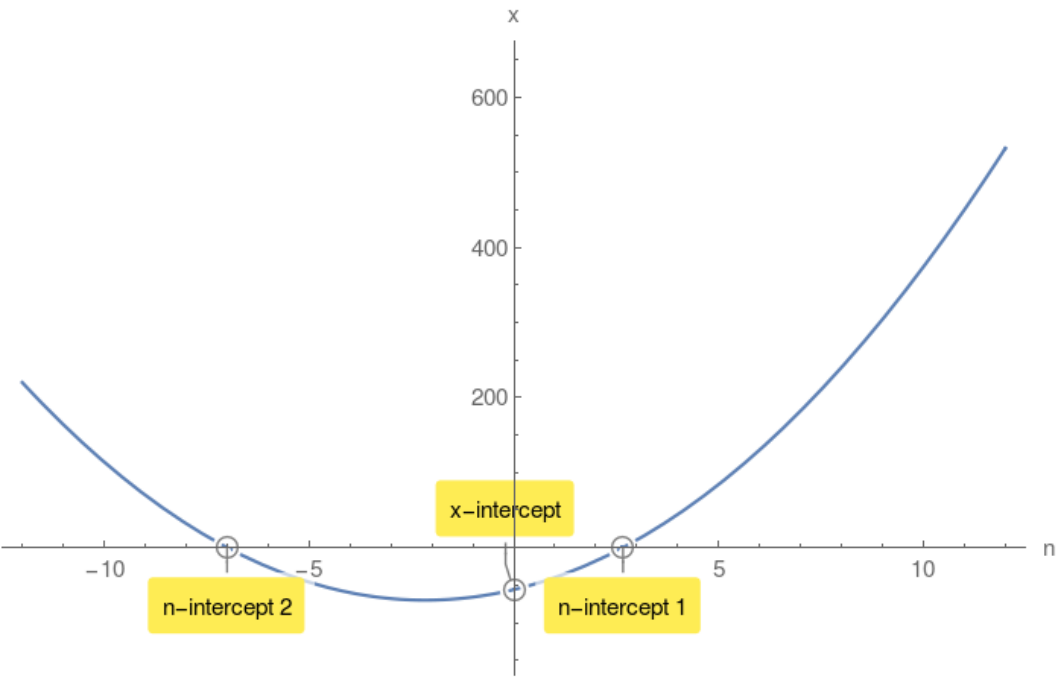
Example 1.

$x(n)=3\,n^2+13\,n-56$ compute its discriminant $\triangle$:

$\triangle=841>0$

$n_{1,2}=\frac{8}{3},-7$

$x(0)=-56$ x-intercept.



Case2: $\triangle=0$

$n_{1,2}=\frac{-b\pm\sqrt{b^2-4\,ac}}{2a}=\frac{-b\pm0}{2a}=\frac{-b}{2a}$ single n-intercept of multiplicity 2.

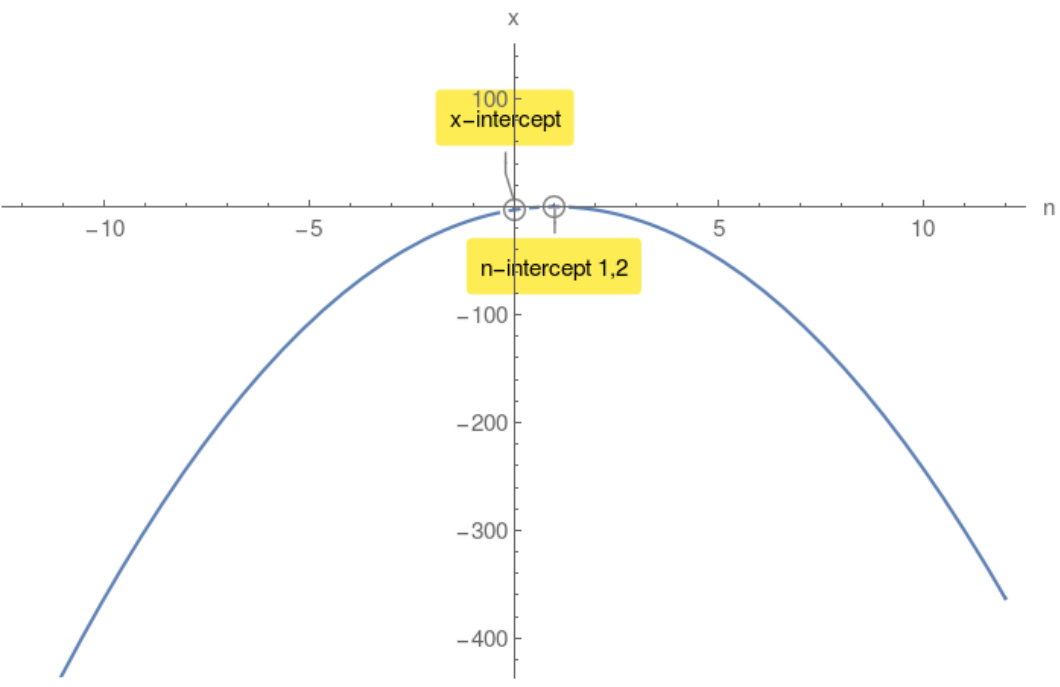
Example 2.

$x(n)=-3\,n^2+6\,n-3$ compute its discriminant $\triangle$:

$\triangle=0$

$n_{1,2}=1,1$

$x(0)=-3$ x-intercept.



Case3: $\triangle<0$

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

However there is a x-intercept.

Example 3.

$x(n)=-4\,n^2+56\,n-245$ compute its discriminant $\triangle$:

$\triangle=-784<0$

$x(0)=-245$ x-intercept.