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.

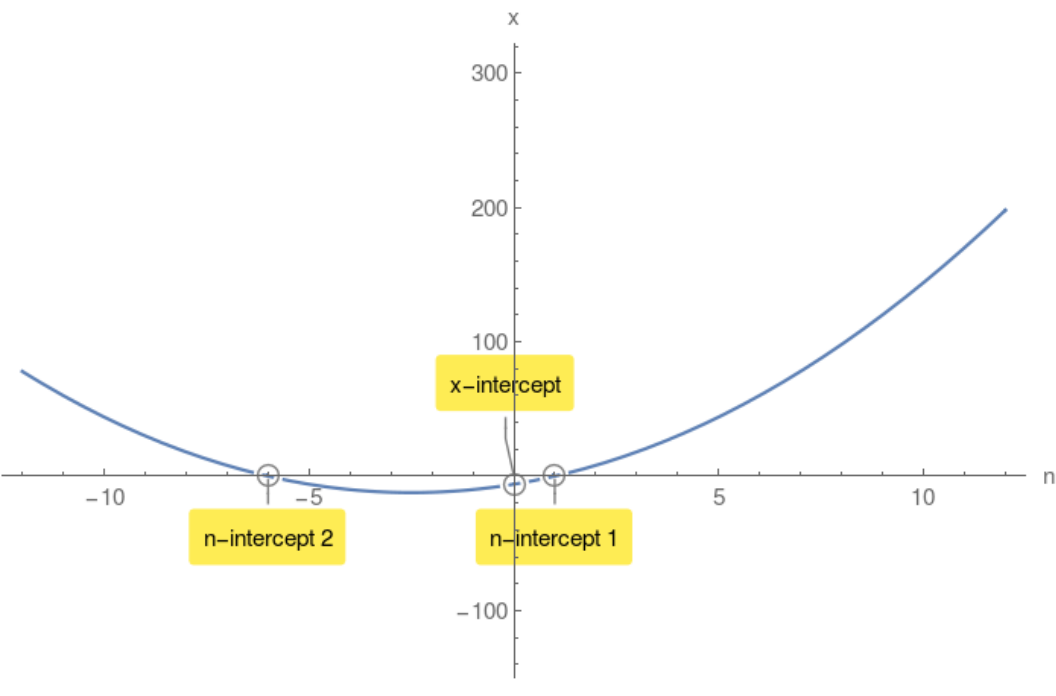
Example 1.

$x(n)=n^2+5\,n-6$ compute its discriminant $\triangle$:

$\triangle=49>0$

$n_{1,2}=1,-6$

$x(0)=-6$ 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.

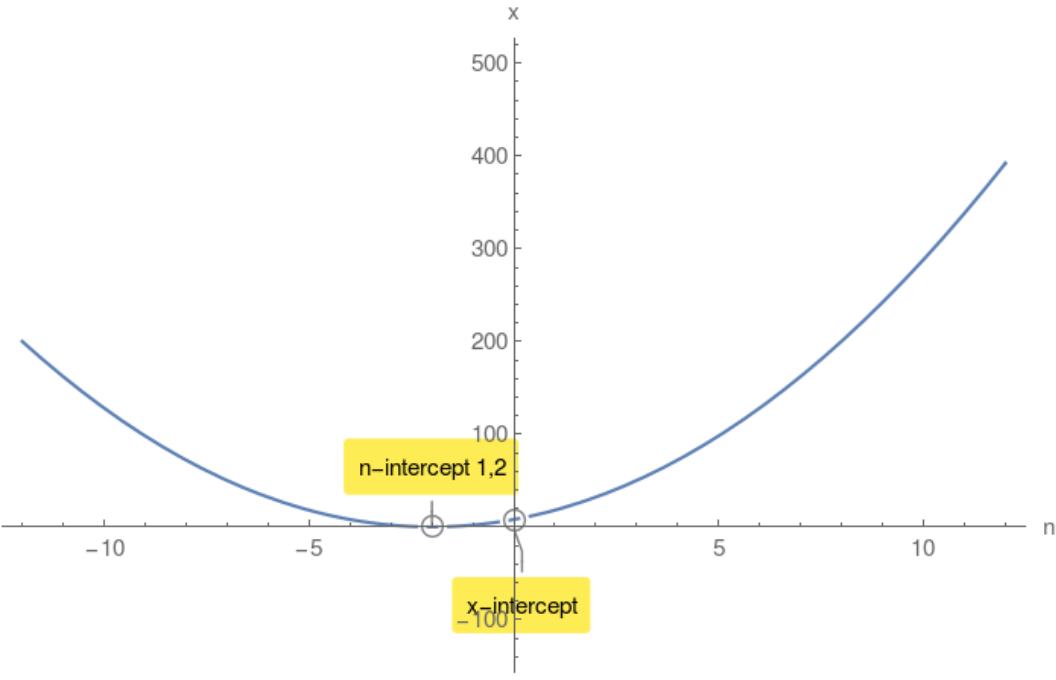
Example 2.

$x(n)=2\,n^2+8\,n+8$ compute its discriminant $\triangle$:

$\triangle=0$

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

$x(0)=8$ 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.

$x(n)=-4\,n^2-72\,n-405$ compute its discriminant $\triangle$:

$\triangle=-1296<0$

$x(0)=-405$ x-intercept.