Intercepts of the Quadratic

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

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

Case1: $\triangle > 0$

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

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

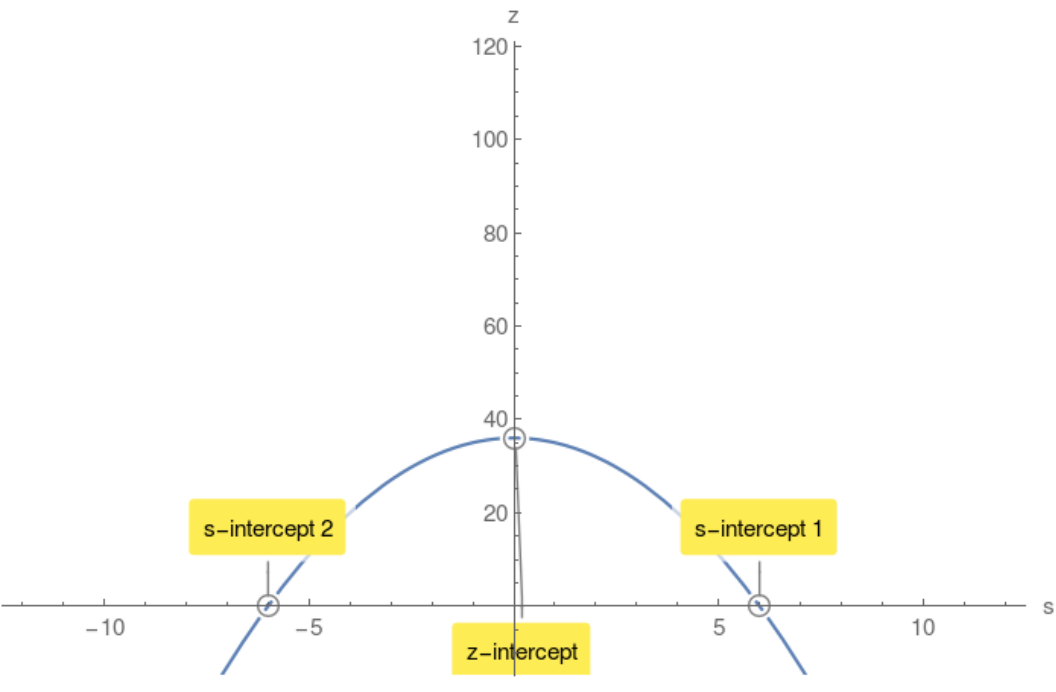
Example 1.

$z(s) = 36 - s^2$ compute its discriminant $\triangle$:

$\triangle = 144 > 0$

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

$z(0) = 36$ z-intercept.



Case2: $\triangle = 0$

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

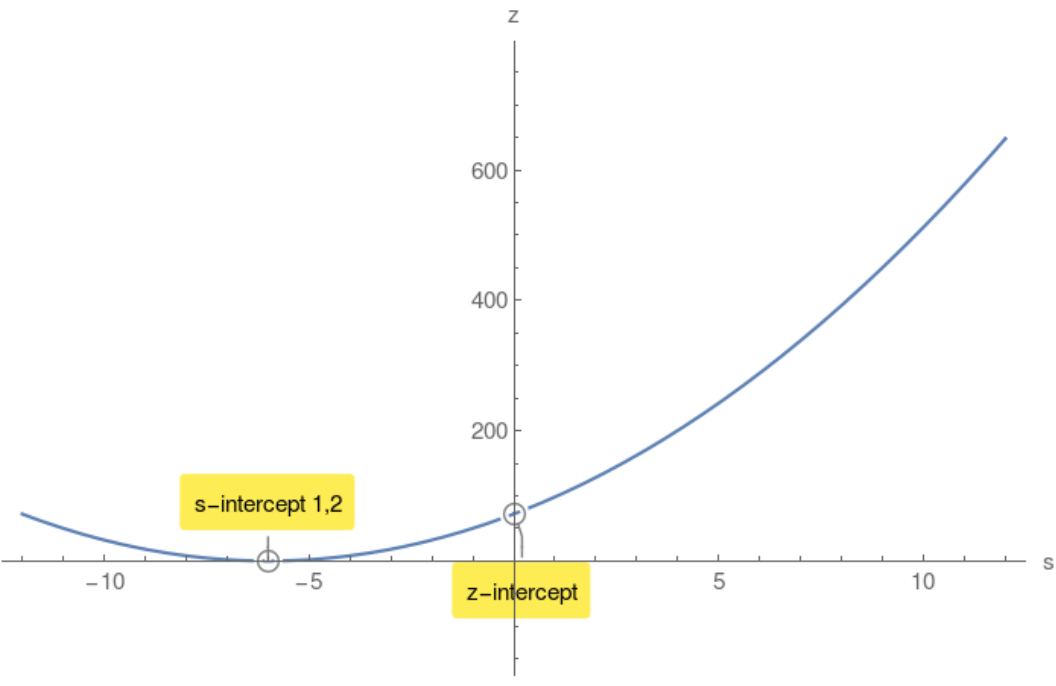
Example 2.

$z(s) = 2\,s^2 + 24\,s + 72$ compute its discriminant $\triangle$:

$\triangle = 0$

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

$z(0) = 72$ z-intercept.



Case3: $\triangle < 0$

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

However there is a z-intercept.

Example 3.

$z(s) = -4\,s^2 - 56\,s - 245$ compute its discriminant $\triangle$:

$\triangle = -784 < 0$

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