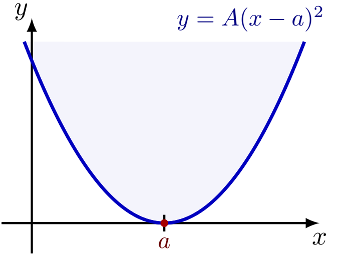
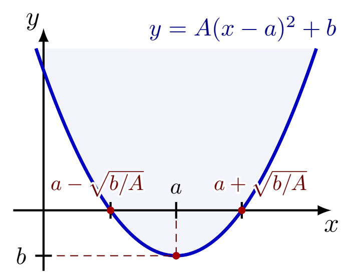
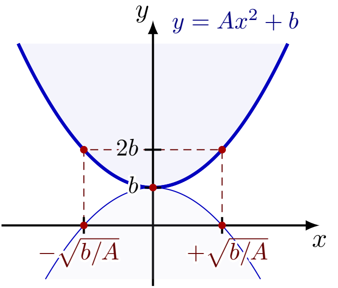


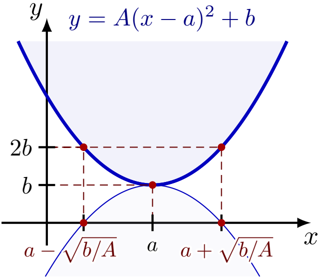
y
y = A(x − a)²
x
a



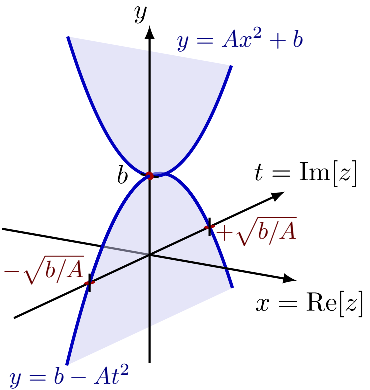
y
$y = A(x-a)^2 + b$
$a - \sqrt{b/A}$
a
$a + \sqrt{b/A}$
x
b



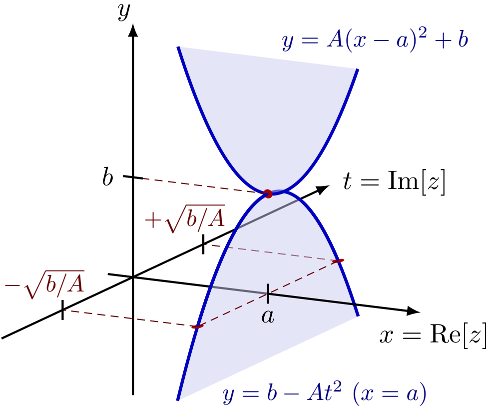
y
$y = Ax^2 + b$
$2b$
b
x
$-\sqrt{b/A}$
$+\sqrt{b/A}$



y
$y = A(x-a)^2 + b$
$2b$
b
x
$a - \sqrt{b/A}$
a
$a + \sqrt{b/A}$



y
$y = Ax^2 + b$
b
$t = \text{Im}[z]$
$+\sqrt{b/A}$
$-\sqrt{b/A}$
$x = \text{Re}[z]$
$y = b - At^2$



y
$y = A(x-a)^2 + b$
b
$t = \mathrm{Im}[z]$
$+\sqrt{b/A}$
$-\sqrt{b/A}$
a
$x = \mathrm{Re}[z]$
$y = b - At^2\ (x = a)$

Take an upward (convex) parabola with a quadratic equation

$$y = A(x-a)^2 + b, \tag{1}$$

with real $A, b > 0$. If $a = 0$, there two imaginary roots

$$x = \pm i\sqrt{\frac{b}{A}}.$$

If $a \neq 0$, there are two complex solutions

$$x = a \pm i\sqrt{\frac{b}{A}}.$$

To extend the graph from the real x axis to the complex plane, substitute a complex number $z = x + it$ for real x, t:

$$y = \mathrm{Re}\big[A(x + it - a)^2 + b\big].$$

Rewriting,

$$y = \mathrm{Re}\big[A(x-a)^2 - At^2 + b\big].$$

If $t = 0$, we retrieve the “real parabola” (1). The “complex parabola” that has the same solution for $x = a$ is

$$y = b - At^2.$$