Suppose we have z = a + bi and we want to find x + yi such that:

Squaring both sides gives:

Multiplying this out gives:

Grouping real and imaginary parts gives:

and:

Solving this last equation for y gives:

Now we can plug that into the equation for a to get a in terms of x only:

Multiplying both sides by gives:

Rearrange this to get:

Now we can use the quadratic formula to solve for . Recall that the quadratic equation solves the equation and gives the solutions:

In this example, when we replace with and the values of A, B, and C are:

Plugging those values into the quadratic equation to solve for and taking the positive value for ± solution gives:

Taking the square root of both sides gives:

If you plug this into the equation for y in terms of x and rearrange a bit, you get:

Now you can multiply by:

to get:

So:

The magnitude of a complex number z is defined as:

And gives the sign of b, so we can simplify slightly: