

# Solutions to the exercises, specified in the example of the ExSol package

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**Exercise 2-1:** Solve the following equation for  $x \in C$ , with  $C$  the set of complex numbers:

$$5x^2 - 3x = 5 \quad (1)$$

**Solution:** Let's start by rearranging the equation, a bit:

$$5.7x^2 - 3.1x = 5.3 \quad (2)$$

$$5.7x^2 - 3.1x - 5.3 = 0 \quad (3)$$

The equation is now in the standard form:

$$ax^2 + bx + c = 0 \quad (4)$$

For quadratic equations in the standard form, we know that two solutions exist:

$$x_{1,2} = \frac{-b \pm \sqrt{d}}{2a} \quad (5)$$

with

$$d = b^2 - 4ac \quad (6)$$

If we apply this to our case, we obtain:

$$d = (-3.1)^2 - 4 \cdot 5.7 \cdot (-5.3) = 130.45 \quad (7)$$

and

$$x_1 = \frac{3.1 + \sqrt{130.45}}{11.4} = 1.27 \quad (8)$$

$$x_2 = \frac{3.1 - \sqrt{130.45}}{11.4} = -0.73 \quad (9)$$

The proposed values  $x = x_1, x_2$  are solutions to the given equation.

**Exercise 2-2:** Consider a 2-dimensional vector space equipped with a Euclidean distance function. Given a right-angled triangle, with the sides  $A$  and  $B$  adjacent to the right angle having lengths, 3 and 4, calculate the length of the hypotenuse, labeled  $C$ .

**Solution:** This calls for application of Pythagoras' theorem, which tells us:

$$\|A\|^2 + \|B\|^2 = \|C\|^2 \quad (10)$$

and therefore:

$$\|C\| = \sqrt{\|A\|^2 + \|B\|^2} \quad (11)$$

$$= \sqrt{3^2 + 4^2} \quad (12)$$

$$= \sqrt{25} = 5 \quad (13)$$

Therefore, the length of the hypotenuse equals 5.