

Lab. 1 - Expressions and Functions

For the exercises below, use the Spyder IDE. Make sure you create a working directory in your computer and select it in the File Explorer window of Spyder. In the Editor window create a file “lab1.py”, and define the functions with the signatures below. Test the functions created from the console, after importing the file with command “import lab1”.

1. def equation_1(a,b):

Returns the solution of equation $ax + b = 0$ (assume $a \neq 0$).

2. def equation_2(a,b,c):

Returns the solution of equation $ax^2 + bx + c = 0$ (assume that $a \neq 0$, and $b^2 - 4ac \geq 0$).

3. def sigmoid(x, b, k):

Returns the value of function sigmoid (centred at zero), with parameters **b** and **k**, at an arbitrary point **x** in the interval $x \in]-\infty, +\infty[$. Remind that

$$\text{sigmoid}(x, b, k) = \frac{b}{1 + e^{-kx}}.$$

4. def gauss(x, s):

Return the value of function gauss (centred at zero), with parameter **s** (standard deviation), at an arbitrary point **x** in the interval $x \in]-\infty, +\infty[$. Remind that

$$\text{gauss}(x, s) = \frac{1}{s\sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{x}{s}\right)^2}$$

5. def truncate(x, n):

Returns the value of the real number **x**, truncated to **n** decimal places. For example, the call *truncate(3.141592, 3)* should return 3.141.

6. def length_2(u): and def length_3(v):

Returns the length of vector **u**, encoded as a list of, respectively, 2 and 3 coordinates (i.e. $\langle x, y \rangle$ and $\langle x, y, z \rangle$).

7. def vec_sum_2(u,v): and def vec_sum_3(u,v):

Returns the sum of vectors **u** and **v**, encoded as lists, with respectively 2 and 3 dimensions.

8. def dot_product_2(u,v): and def dot_product_3(u,v):

Returns the dot product of vectors **u** and **v**, encoded as lists, with respectively 2 and 3 dimensions.

9. def angle_2(u,v): and def angle_3(u,v):

Returns the angle, in radians, made by vectors **u** and **v**, encoded as lists, with respectively 2 and 3 dimensions.