

## 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.