ARTIFICIAL INTELLIGENCE

Lab1. *Basic commands in R*

1. Compute the following: $\sin(2\pi)$; $\cos\left(\frac{3}{4}\right)$; $\mathrm{tg}(\pi)$; $\log(100)$; $\ln(15)$; $\log_7\left(\frac{1}{7}\right)$; e^3; $\sqrt[3]{64}$.

2. Create the vector with components from 1 to 10. Sum the elements of this vector.

3. Create vector **x** whose components are even numbers from 2 to 20.
   a) Verify the output of **x***x and **x**^2.
   b) Invert the order of components of **x**.
   c) Compute the sum of components of **x**.
   d) Compute the number of elements in **x**.
   e) Compute the length of **x** (hint: length of the vector is a square root of the sum of squared components of a vector).

4. Create vector **y** with 13 components, such that first component is 5, last component is 10, and all remaining components are equally spread from each other. Compute the number of elements in **y**.

5. Create vectors **z1** and **z2** with 5 replicates of vector (1,2), respectively a repetition of a whole vector and as a repetitions of the components.
   a) Multiply these two vectors by each other using *. What is the result?
   b) Transpose vector **z1** and multiply by **z2** using %*%. What is the result?
   c) Multiply vector **z1** by transpose of **z2** using %*%. What is the result?

6. Create vector **a** whose components are: 1, 3, 6, 2, 7, 4.
   a) Indicate the smallest component of **a.**
   b) Indicate index of the smallest component of **a.**
   c) Indicated indices of all components of **a** which are smaller or equal to 4.
   d) Compute the sum of elements of **a.**
   e) Compute the sum of squared components of **a.**
   f) Compute the length of **a.**
   g) Determine the third component of **a.**
   h) Increase all components of **a** by 4.
   i) Create new vector, **b**, equal to vector **a** without fourth component.
   j) Declare a new vector, **c**, as a sum of **a** and **b.**
   k) Create new vector, **d**, only with components of **a** greater than 4.

7. Create matrix $\mathbf{A} = \begin{pmatrix} 2 & 3 & 0 \\ 1 & -1 & 2 \\ 1 & 1 & -1 \end{pmatrix}$ and compute:
   a) transpose of **A**
   b) determinant of **A**
   c) trace of **A**
   d) $\mathbf{A}^2$ (compare the results of multiplications: * and %*%)
   e) product of **A** and a vector created from main diagonal of **A**
   f) the inverse of **A (**multiply **A** and its inverse to check correctness of the result)
   g) create new vector, **a,** which is equal to the third column of **A**
   h) create new vector, **b**, which is equal to the second row of **A**
   i) multiply **a** and **b** in a proper way to get scalar and matrix.

8. Create two arbitrary vectors, **x** and **y**, consisting of 10 components.
   a) Draw the points (*x*, *y*) on the graph (scatter plot).
   b) Combine vectors **x** and **y** together using data.frame command and draw the resulting graph.
   c) Combine vectors **x** and **y** together using rbind and cbind commands and draw the resulting graphs.

9. Draw the function $f(x) = x^2+3x-5$ on the interval (-3, 4). Try to draw other functions.