**Risk analysis lab 2018. 09. 11. (Introduction, part 1.)**

1. Create a new notebook (`lab1.ipynb`) and define variable $A$, $b$ and $c$:

   \[
   A = \begin{bmatrix}
   1 & 1 & 1 \\
   2 & 2 & 1 \\
   3 & 3 & 1 \\
   \end{bmatrix}, \quad b = \begin{bmatrix}
   2 \\
   5 \\
   6 \\
   \end{bmatrix}, \quad c = \frac{2}{3}.
   \]

2. Solve the $Ax = b$ linear equation system and print $x$. (help)

3. Multiply the last row of $A$ and the last element of $b$ by $c$. Solve the linear equation system again and print $x$. What do you expect? Why?

4. Print the maximal eigenvalue and the corresponding eigenvector of matrix $A$. (help)

5. Plot the sine function over the domain $-2\pi < t < 2\pi$.
   a. Use `numpy.arange()` to define the range.
   b. The increment between the elements should be 0.01.
   c. You can use the `numpy.pi` constant.

6. Add Gaussian noise $N(\mu, \sigma)$, $\mu = 0$ and $\sigma = \frac{1}{6}$ to the sine wave and plot again.
   a. Use `numpy.random.normal()` to generate normally distributed random numbers.

7. Given the vector $s = [1 \ 8 \ 3 \ 5 \ 9 \ 0 \ 1]$, create a short set of commands that will compute the running sum (for element $j$, the running sum is the sum of the elements from 1 to $j$, inclusive. Check with `numpy.cumsum()`)
   a. Use a for loop.

8. Write function `[pi_value] = calcPi(K)` that calculates the value of $\pi$ using the following series:

   \[
   \pi = \sum_{k=0}^{\infty} \frac{1}{16^k} \left( \frac{4}{8k + 1} - \frac{2}{8k + 4} - \frac{1}{8k + 5} - \frac{1}{8k + 6} \right)
   \]

9. Write a script or a function that finds how many terms are needed to obtain an accuracy of $1e-10$.
   a. Use the `numpy.pi` constant as reference.