Abdullah Gül University
Computer Engineering Department
Student name:
Student UID:

Due March 21, 2022
Assignment 1

Comp 206

Question 1

Generate 100 random in [0,100] and plot following function in matlab

- exp
- log
- sine
- cosine

save the resulting figures in eps format and import them in LaTeX and compile.

Question 2

Load input.txt file from Canvas and create following matrix:

$$\mathbf{P} = \mathbf{I} - \mathbf{D}^{-1/2}\mathbf{A}\mathbf{D}^{-1/2}$$

a) Compute first two eigenvalues and eigenvectors of this matrix and report running time of this computation, where $\mathbf{D}$ is degree matrix, $\mathbf{I}$ denotes identity matrix and $\mathbf{A}$ is adjacency matrix.
b) Scatter plot the first two eigenvectors and save it as eps file.
c) For $\sigma = 0.6$ compute the eigenvalues of $\mathbf{P} + \sigma\mathbf{I}$
d) compute eigenvectors of $\mathbf{P}^{20}$ and report time by using tic; toc in matlab

Question 3

Create a new matrix as:

$$\widehat{\mathbf{P}} = \mathbf{I} - 0.85 * \mathbf{D}^{-1/2}\mathbf{A}\mathbf{D}^{-1/2}$$

a) Solve $\widehat{\mathbf{P}}\mathbf{x} = \mathbf{b}$, where vector $\mathbf{b}$ contains $1/10$ in the first 10 entries and 0 otherwise. and report time
b) Can you solve this problem writing more efficient algorithm, argue it and if you can show time of the algorithm you propose here.

Question 4

Compare the run time of three solutions:
a) Write a recursive function for computing Fibonacci series for n = 1000.
b) Write another algorithm solve this problem as matrix vector product.
c) Solve the same problem as an eigenvalue problem.