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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:

$$P = I - D^{-1/2}AD^{-1/2}$$

- a) Compute first two eigenvalues and eigenvectors of this matrix and report running time of this computation, where **D** is degree matrix, **I** denotes identity matrix and **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 $\hat{\mathbf{P}}\mathbf{x} = \mathbf{b}$, 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.