Assignment_1

November 16, 2024

#Assignment 1

Due EOD Monday Sept 16th.

Please include sufficient documentation to support the 'method' marks.

##Question 1

{method, implementation, answer}

Examine the value of sparse matricies by comparing the approximate computational efficiencies of sparse and dense solvers on a tridiagonal system. Use the %timeit function to approximate the complexity.

HINT: Refer to the last example from Thursday's lecture on how to generate, store, and apply sparse solvers.

0.1   Question 2

Consider the truss:

###2a) Write the linear system for P_i {answer}

0.1.1   2b) Solve for P_i using decomposition and back-substitution.

{method, answer}

###2c) Double the loads (18 kN and 12 kN) and solve for P_i again *without refactoring.* {answer}

0.2   Question 3

Consider the matrix:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

0.3   3a) Calculate the condition number of A

{answer}

0.4 3b) Let's use a preconditioner matrix P to improve the condition number of the product $P^{-1}A$. Give 2 examples of P that improve the condition number, one of which being the 'perfect' preconditioner.

{answer, answer}

HINT: consider the easiest linear system to solve.