CEE 6513, Computational Methods in Mechanics Project, Fall 2023

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1 Objectives

Consider the Poisson equation

$$-\frac{d^2u}{dx^2} = \rho \tag{1}$$

on the interval $[-L, L]$ subject to periodic boundary conditions.

- Determine the energy functional corresponding to Eqn. 1.
- Assuming L to be very large and $\rho = e^{-x^2} + c$, determine the constant c such that Eqn. 1 is well posed.
- For $L = 10$, solve Eqn. 1 using the finite-element, finite-difference, and Fourier methods. Determine the corresponding energy, and demonstrate convergence of the methods with respect to discretization, while determining their convergence rates. Compare and contrast the results obtained, and discuss the relative efficiency of the approaches.

2 Report

In addition to the source code, a report of not more than 2 pages needs to be submitted.