Homework 3: Report

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Question 1: BVP for 2D Poisson's Equation

a) Write Code to solve (1)

$$\begin{cases} \nabla^2 U(x,y) = f(x,y) & (x,y) \in \Omega \\ U(x,y) = g(x,y) & (x,y) \in \partial\Omega, \end{cases} \tag{1}$$
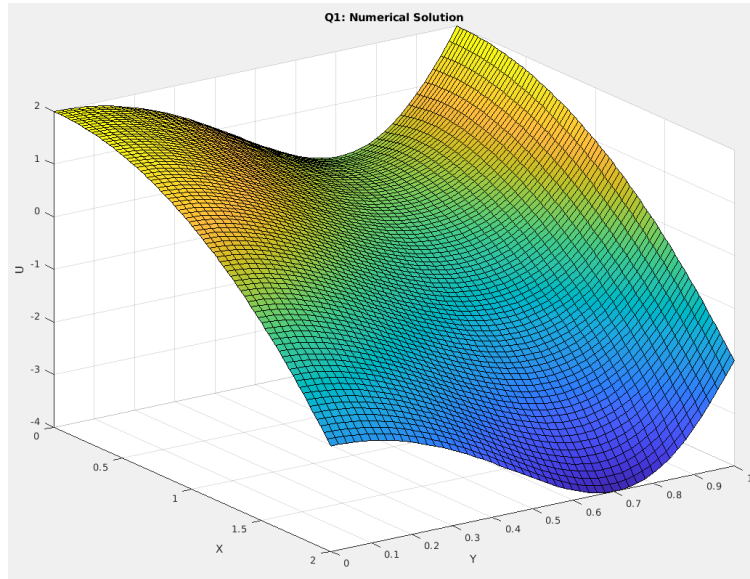

Figure 1: Numerical Solution to (1) with $N = 81, M = 51$

b)

c)

Question 2: IBVP for 1D Heat Equation

a) Determine the analytical solution

b) Plot the analytical solution as a surface plot over [x, t]

c) Write code and integrate using secodn-order finite differences and CN

d) Wrote code and integrate using Gauss-Chebyshev-Lobatto coallocation method

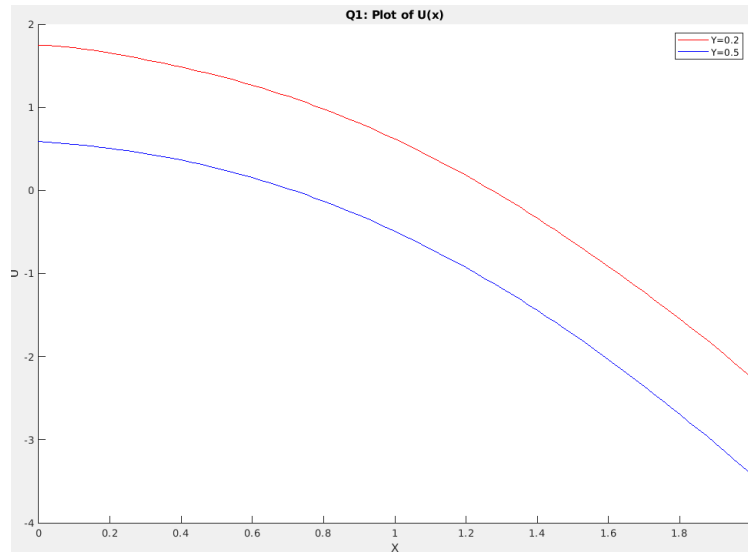e) plot maximum pointwise error on a log scale plot between analytical and numerical solutions

Figure 2: Numerical Solution to (1) at $Y = 0.2, 0.5$

Question 3: Extra Credit

a) Write code to compute the nuemrical solution using secondorder finite diff, and AB2.

b) plot the numerical solution as a surface plot

c) plot the numerical sollution at t = 62 as a function of x.