Please answer the below questions:

Q2 (15pts): <u>Problem 1. (Laplace equation).</u>

Consider a rectangular sheet of metal with dimensions 1 meter by 2 meters. The sheet is heated, and the edges are maintained at constant temperatures: the top edge is at 100 degrees Celsius, the bottom edge is at 50 degrees Celsius, the left edge is at 0 degrees Celsius, and the right edge is at 75 degrees Celsius.

Using the central finite difference method, determine the steady-state temperature distribution on the sheet. Divide the sheet into a grid with 5 points along the x-axis and 6 points along the y-axis. Assume the initial guess for the temperature at each grid point is 25 degrees Celsius.

Calculate the temperatures at each grid point using the described method until the solution converges. Use a convergence criterion of 0.01 degrees Celsius.

Interpret the results: Based on the temperature distribution, you can make observations and draw conclusions. Identify regions of higher and lower temperatures, note any gradients or temperature variations across the sheet, and examine how the boundary conditions affect the temperature distribution. For example, you can analyze how the heated edges influence the temperature distribution within the sheet.