

1. A rectangular space defined by  $0 < x < 4$  and  $0 < y < 2$  has a spatially non-uniform charge density given by  $\rho(x,y) = \sin(2\pi x)\sin^2(\pi y)$ . Determine the electric potential inside the domain assuming that the surface of the rectangular region is grounded.
2. Download the data file Problem2\_data.txt and fit the solution to a third order polynomial.
3. Using the same data file, fit the data using

$$\lambda \frac{\partial^2 f}{\partial x^2} - f = f_{data}$$

How does your fit depend on  $\lambda$ ? Is there a choice for  $\lambda$  that you feel works well? Explain why.

4. Download the data file Problem4\_data.txt. The first column of data in this file is time, and the second column is the amplitude of a wave. Determine the power spectrum of the data and tell what the three most dominant frequencies are.