MAE/MSE 502, Spring 2022 HW2 Solution

Problem 1

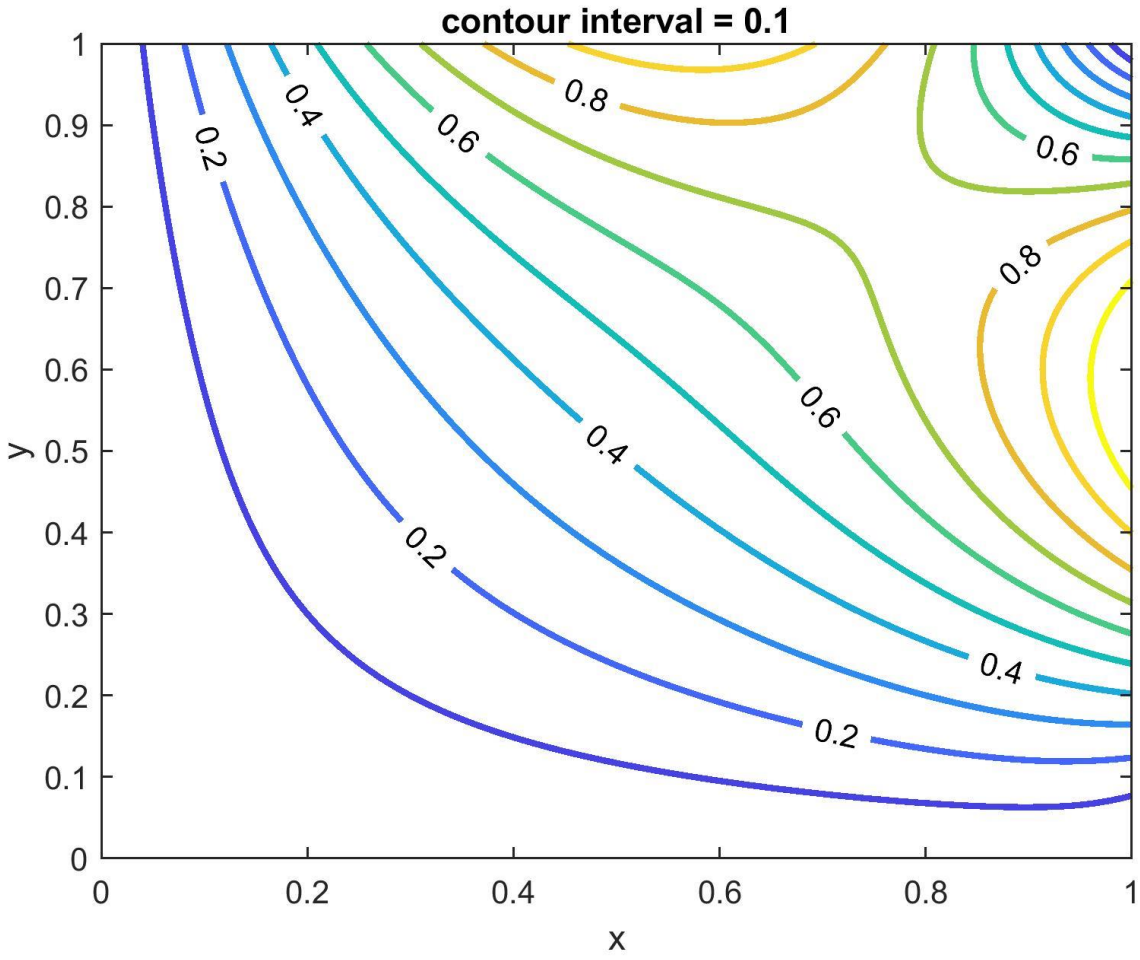
$$u(x,y) = \sum_{n=1}^{\infty} a_n \sin(n\pi y)\sinh(n\pi x) + b_n \sin(n\pi x)\sinh(n\pi y)$$

where

$$a_n = \frac{2}{\sinh(n\pi)} \int_0^1 1.5\sqrt{y}\sin(\pi y)\sin(n\pi y)\,dy$$

$$b_n = \frac{2}{\sinh(n\pi)} \int_0^1 2.5\,(x - x^3)\sin(n\pi x)dx$$

Plot:



Problem 2

(a) Solution is unique: $u(x, y) = (3x + 2)\sin(2\pi y)$

(b) There are infinite many solutions: $u(x, y) = (3x + B)\sin(2\pi y)$, where *B* is an arbitrary constant.

Problem 3

$$u(x, y) = \left(y^4 + \frac{2}{y}\right)\cos(3x)$$