

12.8 Heat Equation on a Rectangular Domain
Due: Monday, November 12, 2018

Solve the heat equation $u_t = u_{xx} + u_{yy}$ on the square $[0, \pi] \times [0, \pi]$ with the following boundary and initial conditions. Each problem is 5 points.

1. $u(0, y, t) = 0, u(\pi, y, t) = 0, 0 < y < \pi$
 $u(x, 0, t) = 0, u(x, \pi, t) = 0, 0 < x < \pi$
 $u(x, y, 0) = 10$
2. $u_x(0, y, t) = 0, u_x(\pi, y, t) = 0, 0 < y < \pi$
 $u_y(x, 0, t) = 0, u_y(x, \pi, t) = 0, 0 < x < \pi$
 $u(x, y, 0) = 10$
3. $u(0, y, t) = 0, u(\pi, y, t) = 0, 0 < y < \pi$
 $u(x, 0, t) = 0, u(x, \pi, t) = 0, 0 < x < \pi$
 $u(x, y, 0) = 2 \sin(x) \sin(4y)$
4. $u_x(0, y, t) = 0, u_x(\pi, y, t) = 0, 0 < y < \pi$
 $u_y(x, 0, t) = 0, u_y(x, \pi, t) = 0, 0 < x < \pi$
 $u(x, y, 0) = 1 - \cos(3x) + 7 \cos(x) \cos(2y)$