

1. Solve  $\Delta u = 0$  on  $x \in [0, 4]$ ,  $y \in [0, 3]$ , with  $u(x, 0) = u(x, 3) = 0$  where
  - (a)  $u_x(0, y) = 0$  and  $u_x(4, y) = \cos(\pi y)$
  - (b)  $u(0, y) = 1$  and  $u(4, y) = 0$  (Hint: Translate the  $x$  coordinate so that  $u(0, y) = 0$ . This means that  $x$  goes between  $-4$  and  $0$ . Now go back to  $0$  to  $4$  with a  $y$ -axis flip.)
2. Solve  $u_{tt} = 4u_{xx}$  on  $x \in [0, 3]$ ,  $t \in [0, \infty)$ , with  $u(0, t) = u(3, t) = 0$  where
  - (a)  $u(x, 0) = 4 \sin(2\pi x) + 7 \sin(6\pi x) - 2 \sin(\pi x)$ ,  $u_t(x, 0) = 0$
  - (b)  $u(x, 0) = x(3 - x)$ ,  $u_t(x, 0) = \sin(\pi x)$