

Laboratory 6: Solutions of second order PDE with two variables

1. Find the solutions for the Cauchy problem for the infinite vibrating string equation in the following cases and plot them:

(a) $a = 1, f(t, x) = 0, u_0(x) = e^x, u_1(x) = \cos(x);$

(b) $a = 2, f(t, x) = tx, u_0(x) = \sin(x), u_1(x) = \cos(2x);$

(c) $a = 1, f(t, x) = \sin(x), u_0(x) = \sin(x), u_1(x) = 0;$

(d) $a = 1, f(t, x) = e^x, u_0(x) = \sin(x), u_1(x) = x + \cos(x);$

2. Find the solutions of the mixed problem for the vibrating string equation in the following cases and plot them:

(a) $a = 1, l = \pi, f(t, x) = 0, u_0(x) = \sin(x) - 2\sin(3x), u_1(x) = \sin(2x);$

(b) $a = 2, l = \pi, f(t, x) = t^2 \sin(x), u_0(x) = 2\sin(x), u_1(x) = 0;$

(c) $a = 1, l = \pi, f(t, x) = \cos(t) \sin(x), u_0(x) = 2, u_1(x) = 0;$

(d) $a = 1, l = \pi, f(t, x) = \cos(t) \sin(x), u_0(x) = x, u_1(x) = 0;$

3. Find the solutions of the mixed problem for the heat equation in the following cases and plot them:

(a) $a = 1, l = \pi, f(t, x) = 0, u_0(x) = 2\sin(3x) - 5\sin(5x);$

(b) $a = 2, l = \pi, f(t, x) = t \sin(x), u_0(x) = 2\sin(x) - 3\sin(2x);$

(c) $a = 1, l = \pi, f(t, x) = 0, u_0(x) = 3;$

(d) $a = 1, l = \pi, f(t, x) = \sin(t) \sin(2x), u_0(x) = 3;$