

Problem 1

Find solution  $u(x, t)$  of

$$\begin{aligned}u_{tt}(x, t) - u_{xx}(x, t) &= \sin(x), & -\infty < x < \infty, & \quad t > 0, \\u(x, t)|_{t=0} &= 0, \\u_t(x, t)|_{t=0} &= 0.\end{aligned}$$

Problem 2

Find solution  $u(x, t)$  of

$$\begin{aligned}u_t(x, t) &= u_{xx}(x, t), & -\infty < x < \infty, & \quad t > 0, \\u(x, t)|_{t=0} &= \cos(2x) \exp(-x^2).\end{aligned}$$

N.B. Please write:

- how the above problems are called
- what is your method of solution
- in which functional space you search for solution, and express it in terms of elementary functions (e.g. rational, trigonometric and/or exponential).