



**PDE and Boundary-Value Problems (Winter Term 2013/2014)**  
**Assignment H5 - Homework**

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**Problem 5.1 (Solving IBVP - 6 Points)**

Solve the semi-infinite string problem:

$$\text{PDE: } u_{tt} = u_{xx}, \quad 0 < x < \infty, \quad 0 < t < \infty$$

$$\text{BC: } u(0, t) = 0, \quad 0 < t < \infty$$

$$\text{ICs: } \begin{cases} u(x, 0) = xe^{-x^2} \\ u_t(x, 0) = 0 \end{cases}, \quad 0 < x < \infty$$

**Problem 5.2 (Solving the IBVP - 6 Points)**

Find the solution to the following vibrating-string problem

$$\text{PDE: } u_{tt} = \alpha^2 u_{xx}, \quad 0 < x < L, \quad 0 < t < \infty$$

$$\text{BCs: } \begin{cases} u(0, t) = 0 \\ u(L, t) = 0 \end{cases}, \quad 0 < t < \infty$$

$$\text{ICs: } \begin{cases} u(x, 0) = \sin(\pi x/L) + 0,5 \sin(3\pi x/L) \\ u_t(x, 0) = 0 \end{cases}, \quad 0 \leq x \leq L$$

**Problem 5.3 (The Vibrating Beam - 7 Points)**

What is the solution to the simply supported (at both ends) beam problem with ICs

$$\begin{aligned} u(x, 0) &= \sin(\pi x) \\ u_t(x, 0) &= \sin(\pi x) \end{aligned} \quad 0 \leq x \leq 1$$

**Deadline for submission:** Friday, January 10, 12am