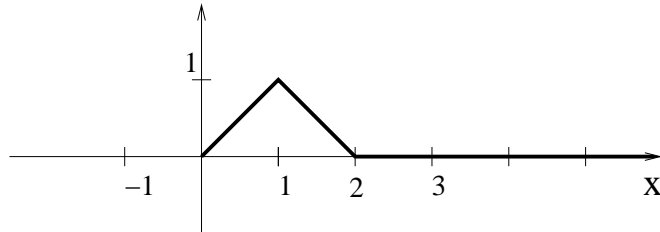


Fall 2008 - Math 462 Section 0101
Partial Differential Equations for Scientists and Engineers
 Homework #6 - Due Thursday Oct 16th

1. (20pt) Solve $u_t = ku_{xx}$, $u(x, 0) = e^{-x}$, $u(0, t) = 0$ on the half line $0 < x < \infty$.
2. (25pt) Let $u(x, t)$ be the solution of

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

with ϕ given by:



Sketch $u(x, t)$ for $t = 1/2$, $t = 1$, $t = 3/2$, $t = 2$, and describe the behavior for u as t increases.

3. (30pt) Let $u(x, t)$ be the solution of

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

with

$$\psi(x) = \begin{cases} 1 & \text{if } 1 < x < 2 \\ 0 & \text{otherwise.} \end{cases}$$

Plot $u(x, t)$ at $t = 0$, $t = 1$, $t = 2$ and $t = 3$.

4. (25pt) Solve the Neumann problem for the wave equation on the half-line $0 < x < \infty$.