

Math 524 Exam 11: 12/11/8
Please read the exam instructions.

Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on **separate paper**, indicate clearly what work goes with which problem, and put your name on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Keep this list of problems for your records. Show all necessary work in your solutions; if you are unsure, show it. Each problem is worth 10 points. You have approximately 30 minutes.

Set $s(x) = \begin{cases} 1 & 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$. These problems all concern propagation of a square wave, with $v = 1/3$, initial position $f(x, 0) = f_0(x) = s(x)$, and initial velocity $\frac{\partial f}{\partial t}(x, 0) = g_0(x) = 0$.

For each of the following problems, compute $f(x, t)$ for all x, t , and sketch three solutions: for $t = 1, t = 3, t = 60$.

Note: $s(x)$ is not twice-differentiable (or even continuous). Don't worry about this. If it bothers you, think of the wave as the limit of a sequence of waves that are each twice-differentiable.

1. Domain is \mathbb{R} .
2. Domain is $[0, \infty)$, with Dirichlet boundary condition.
3. Domain is $[0, \infty)$, with Neumann boundary condition.
4. Domain is $[0, 7]$, with Dirichlet boundary conditions.