

Math 442 Homework 11: (due April 25, 2018)

1. Page 342 Problem 2: An infinite string, at rest for $t < 0$, receives an instantaneous transverse blow at $t = 0$ which imparts an initial velocity of $V\delta(x - x_0)$, where V is a constant. Find the position of the string for $t > 0$.
2. Page 349 Problem 9: Use Fourier transforms to solve the ODE: $-u_{xx} + a^2u = \delta(x)$, where $\delta(x)$ is the delta function.
3. Page 352 Problem 1: Use the Fourier transform directly to solve the heat equation with a convection term, namely, $u_t = ku_{xx} + \mu u_x$ for $-\infty < x < \infty$, with an initial condition $u(x, 0) = \phi(x)$, assuming that $u(x, t)$ is bounded and $k, \mu > 0$.
4. Page 352 Problem 2: Use the Fourier transform in the x variable to find the harmonic function in the half-plane $\{y > 0\}$ that satisfies the Neumann condition $\partial u / \partial y = h(x)$ on $\{y = 0\}$.
5. Page 352 Problem 6: Use the Fourier transform to solve $u_{xx} + u_{yy} = 0$ in the infinite strip $\{0 < y < 1, -\infty < x < \infty\}$, together with the conditions $u(x, 0) = 0$ and $u(x, 1) = f(x)$.