

Homework Set D

1. Solve the Laplace equation in the first quadrant:

$$\begin{aligned}\Delta u &= 0, \quad x > 0, y > 0, \\ u(x, 0) &= f(x), \quad x > 0; \quad u_x(0, y) = 0, \quad y > 0.\end{aligned}$$

2. Find $\mathcal{F}^{-1} [e^{-a|\omega|}]$ and $\mathcal{F} [e^{-b|x|}]$ where a and b are positive constants.

3. Solve

$$\begin{aligned}u_t &= \kappa u_{xx} + g(x, t), \quad t > 0, \quad -\infty < x < \infty, \\ u(x, 0) &= f(x), \quad -\infty < x < \infty.\end{aligned}$$

4. Use the convolution theorem to simplify the answer for problem 3. It should be the sum of an integral and a double integral.