

MATH 333: Partial Differential Equations
Project 4, Due Date: Fri., Oct. 13, 2006

Find a resource that defines the two-dimensional Fourier transform (in an analogous way to how the 1-dimensional Fourier transform is defined in our text). There are certain results about 1-D Fourier transforms which have made them useful for certain kinds of IVPs or IBVPs. What are the corresponding results for the 2-D transform? (For an extra half point, provide the proofs.) Use this transform to solve the Cauchy planar diffusion problem

$$\begin{aligned}u_t &= k_1 u_{xx} + k_2 u_{yy}, & (x, y) \in \mathbb{R}^2, & t > 0, \\u(x, y, 0) &= f(x, y), & (x, y) \in \mathbb{R}^2,\end{aligned}$$

where k_1, k_2 are positive constants.