

Exercise 1

Use the Fourier transform directly to solve the heat equation with a convection term, namely, $u_t = \kappa u_{xx} + \mu u_x$ for $-\infty < x < \infty$, with an initial condition $u(x, 0) = \phi(x)$, assuming that $u(x, t)$ is bounded and $\kappa > 0$.