Problem 1.
Consider Laplace equation in the half-strip

\[ u_{xx} + u_{yy} = 0 \quad x > 0, \ -\infty < y < \infty \]

with the boundary conditions

\[ u(0, y) = e^{-|y|} \]

and condition \( \max |u| < \infty \).

Solve using Fourier Transform; write the solution in the form of a Fourier integral.

Problem 2. Consider Laplace equation in the half-strip

\[ u_{xx} + u_{yy} = 0 \quad x > 0, \ -1 < y < 1 \]

with the boundary conditions

\[ u(x, -1) = u(x, 1) = 0, \quad u(0, y) = 1 - |y| \]

and condition \( \max |u| < \infty \).

(a) Write the associated eigenvalue problem.

(b) Find all eigenvalues and corresponding eigenfunctions.

(c) Write the solution in the form of a series expansion.