Exercise 27

Use the double Fourier transform to solve the telegraph equation

$$\begin{aligned} u_{tt} + \alpha u_t + bu = c^2 u_{xx}, \quad -\infty < x, t < \infty, \\ u(0,t) = f(t), \quad u_x(0,t) = g(t), \quad \text{for } -\infty < t < \infty, \end{aligned}$$

where a, b, c are constants and $f(t)$ and $g(t)$ are arbitrary functions of t.