Exercise 20

Apply the Fourier transform to solve the initial-value problem for the dissipative wave equation

$$u_{tt} = c^2 u_{xx} + \alpha u_{xxt}, \quad -\infty < x < \infty, \ t > 0,$$
$$u(x, 0) = f(x), \quad u_t(x, 0) = \alpha f''(x) \quad \text{for } -\infty < x < \infty,$$

where α is a positive constant.