

**Exercise 2.2.3**

Show that  $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2} + Q(u, x, t)$  is linear if  $Q = \alpha(x, t)u + \beta(x, t)$  and, in addition, homogeneous if  $\beta(x, t) = 0$ .