2.7. Telegraph Equation $\dfrac{\partial^2 w}{\partial t^2} + k\dfrac{\partial w}{\partial t} = a^2\dfrac{\partial^2 w}{\partial x^2} + bw$

For $k > 0$ and $b < 0$, it is the *telegraph equation.*

The substitution $w(x,t) = \exp\left(-\frac{1}{2}kt\right)u(x,t)$ leads to the Klein–Gordon equation

$$\frac{\partial^2 u}{\partial t^2} = a^2\frac{\partial^2 u}{\partial x^2} + \left(b + \tfrac{1}{4}k^2\right)u,$$

which is discussed in Subsection 2.3 .

Reference

Polyanin, A. D., *Handbook of Linear Partial Differential Equations for Engineers and Scientists* , Chapman & Hall/CRC, 2002.

