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

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

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

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

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.

Telegraph Equation

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<http://eqworld.ipmnet.ru/en/solutions/lpde/lpde207.pdf>