

$d\cdot \frac{\partial^2 u}{\partial t^2} = L[u] + uf\left(\frac{u}{w}\right) + g\left(\frac{u}{w}\right), \quad \frac{\partial^2 w}{\partial t^2} = L[w] + wf\left(\frac{u}{w}\right) + h\left(\frac{u}{w}\right).$

Here, L is an arbitrary linear differential operator in the variables x_1, \ldots, x_n (of any order in derivatives), whose coefficients can depend on x_1, \ldots, x_n, t .

Solution

$$u = k\theta(x_1, \dots, x_n, t), \quad w = \theta(x_1, \dots, x_n, t),$$

where k is a root of the algebraic (transcendental) equation g(k) = kh(k) and the function $\theta = \theta(x, t)$ satisfies the linear equation

$$\frac{\partial^2 \theta}{\partial t^2} = L[\theta] + f(k)w + h(k).$$

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