



2. Nonlinear Hyperbolic Equations

2.1. Nonlinear Wave Equations of the Form $\frac{\partial^2 w}{\partial t^2} = a \frac{\partial^2 w}{\partial x^2} + f(w)$

1. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial^2 w}{\partial x^2} + \alpha w + b w^n$. Klein–Gordon equation with a power-law nonlinearity.
2. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial^2 w}{\partial x^2} + \alpha w^n + b w^{2n-1}$. Klein–Gordon equation with a power-law nonlinearity.
3. $\frac{\partial^2 w}{\partial t^2} = a^2 \frac{\partial^2 w}{\partial x^2} + b e^{\beta w}$. Modified Liouville equation.
4. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial^2 w}{\partial x^2} + a e^{\beta w} + b e^{2\beta w}$. Klein–Gordon equation with a exponential nonlinearity.
5. $\frac{\partial^2 w}{\partial t^2} = a \frac{\partial^2 w}{\partial x^2} + b \sinh(\lambda w)$. Sinh-Gordon equation.
6. $\frac{\partial^2 w}{\partial t^2} = a \frac{\partial^2 w}{\partial x^2} + b \sin(\lambda w)$. Sine-Gordon equation.
7. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial^2 w}{\partial x^2} + f(w)$. Nonlinear Klein–Gordon equation.

2.2. Other Nonlinear Hyperbolic Equations

1. $\frac{\partial^2 w}{\partial t^2} = a \frac{\partial}{\partial x} \left(w \frac{\partial w}{\partial x} \right)$.
2. $\frac{\partial^2 w}{\partial t^2} = a \frac{\partial}{\partial x} \left(w^n \frac{\partial w}{\partial x} \right) + b w^k$.
3. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial}{\partial x} \left(a e^{\lambda w} \frac{\partial w}{\partial x} \right)$.
4. $\frac{\partial^2 w}{\partial t^2} = \frac{a}{x^n} \frac{\partial}{\partial x} \left(x^n \frac{\partial w}{\partial x} \right) + f(w)$.
5. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial}{\partial x} \left[a(x+b)^n \frac{\partial w}{\partial x} \right] + f(w)$.
6. $\frac{\partial^2 w}{\partial t^2} = \frac{\partial}{\partial x} \left(a e^{\lambda x} \frac{\partial w}{\partial x} \right) + f(w)$.

$$7. \quad \frac{\partial^2 w}{\partial t^2} = \frac{\partial}{\partial x} \left[f(w) \frac{\partial w}{\partial x} \right].$$

The EqWorld website presents extensive information on solutions to various classes of ordinary differential equations, partial differential equations, integral equations, functional equations, and other mathematical equations.

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