



Exact Solutions > Nonlinear Partial Differential Equations > Second-Order Hyperbolic Partial Differential Equations > Klein–Gordon Equation with a Power-Law Nonlinearity - 2

$$2. \quad \frac{\partial^2 w}{\partial t^2} = \frac{\partial^2 w}{\partial x^2} + aw^n + bw^{2n-1}.$$

***Klein–Gordon equation with a power-law nonlinearity - 2.***

1°. Solutions:

$$w(x, t) = \left[ \frac{a(1-n)^2}{2(n+1)} (x \sinh C_1 \pm t \cosh C_1 + C_2)^2 - \frac{b(n+1)}{2an} \right]^{\frac{1}{1-n}},$$
$$w(x, t) = \left\{ \frac{1}{4} a(1-n)^2 [(t + C_1)^2 - (x + C_2)^2] - \frac{b}{an} \right\}^{\frac{1}{1-n}},$$

where  $C_1$  and  $C_2$  are arbitrary constants.

2°. For other exact solutions of this equation, see the [nonlinear Klein–Gordon equation](#) with  $f(w) = aw^n + bw^{2n-1}$ .

### Reference

**Polyanin, A. D. and Zaitsev, V. F.,** *Handbook of Nonlinear Partial Differential Equations*, Chapman & Hall/CRC, Boca Raton, 2004.

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<http://eqworld.ipmnet.ru/en/solutions/npde/npde2102.pdf>