



Systems of Ordinary Differential Equations > Nonlinear Systems of Two Equations

7. $x''_{tt} = x f(y/x), \quad y''_{tt} = y g(y/x).$

A particular periodic solution is given by

$$\begin{aligned}x &= C_1 \sin(kt) + C_2 \cos(kt), & k &= \sqrt{-f(\lambda)}, \\y &= \lambda[C_1 \sin(kt) + C_2 \cos(kt)],\end{aligned}$$

where C_1 and C_2 are arbitrary constants, and λ is a root of the transcendental (algebraic) equation

$$f(\lambda) = g(\lambda). \tag{1}$$

2°. Particular solution:

$$\begin{aligned}x &= C_1 \exp(kt) + C_2 \exp(-kt), & k &= \sqrt{f(\lambda)}, \\y &= \lambda[C_1 \exp(kt) + C_2 \exp(-kt)],\end{aligned}$$

where C_1 and C_2 are arbitrary constants, and λ is a root of the transcendental (algebraic) equation (1).