



Systems of Ordinary Differential Equations > Nonlinear Systems of Two Equations

10. $x''_{tt} = x f(x^2 + y^2, y/x) - y g(y/x), \quad y''_{tt} = y f(x^2 + y^2, y/x) + x g(y/x).$

Particular solution:

$$u = r(t) \cos \beta, \quad w = r(t) \sin \beta,$$

where the constant β is determined by the transcendental equation

$$g(\tan \beta) = 0$$

and the function $r = r(t)$ satisfies the solvable autonomous second-order equation

$$r''_{tt} = r f(r^2, \tan \beta).$$

For $g(z) \equiv 0$, β is an arbitrary constant.