



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