

Systems of Ordinary Differential Equations > Nonlinear Systems of Two Equations

19. 
$$x_{tt}'' = ay_t'\Phi(x,y,t,x_t',y_t') + f(x)$$
,  $y_{tt}'' = bx_t'\Phi(x,y,t,x_t',y_t') + g(y)$ . First integral:

$$b(x_t')^2 - a(y_t')^2 + 2a \int g(y) \, dy - 2b \int f(x) \, dx = C,$$

where C is an arbitrary constant.

Remark. The function  $\Phi$  can also depend on the second and higher derivatives with respect to t.

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http://eqworld.ipmnet.ru/en/solutions/sysode/sode0319.pdf