



Systems of Ordinary Differential Equations > Nonlinear Systems of Two Equations

**4.**  $x'_t = f_1(x)g_1(y)\Phi(x, y, t), \quad y'_t = f_2(x)g_2(y)\Phi(x, y, t).$

First integral:

$$\int \frac{f_2(x)}{f_1(x)} dx - \int \frac{g_1(y)}{g_2(y)} dy = C, \quad (*)$$

where  $C$  is an arbitrary constant.

On solving (\*) for  $x$  (resp.,  $y$ ) and on substituting the resulting expression into either equation of the original solution, one arrives at a first-order equation for determining  $y$  (resp.,  $x$ ).