



Systems of Ordinary Differential Equations > Nonlinear Systems of Three and More Equations

$$2. \quad ax'_t = (b-c)yzf(x, y, z, t), \quad by'_t = (c-a)zxf(x, y, z, t), \quad cz'_t = (a-b)xyf(x, y, z, t).$$

First integrals:

$$ax^2 + by^2 + cz^2 = C_1,$$
$$a^2x^2 + b^2y^2 + c^2z^2 = C_2,$$

where C_1 and C_2 are arbitrary constants. On solving the integrals for y and z and on substituting the resulting expressions into the first equation of the system, one arrives at a first-order equation (if the function F is independent of t , this equation is separable).