



Exact Solutions > Ordinary Differential Equations > First-Order Ordinary Differential Equations > Riccati Equation, Special Case 1

$$7. \quad y'_x = y^2 + f(x)y - a^2 - af(x).$$

Riccati equation, special case 1.

Particular solution: $y_0 = a$.

The general solution can be written as:

$$y = a + \Phi(x) \left[C - \int \Phi(x) dx \right]^{-1}, \quad \text{where } \Phi(x) = \exp \left\{ 2ax + \int f(x) dx \right\},$$

C is an arbitrary constant.

Reference

Polyanin, A. D. and Zaitsev, V. F., *Handbook of Exact Solutions for Ordinary Differential Equations, 2nd Edition*, Chapman & Hall/CRC, Boca Raton, 2003.

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