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$$22. \quad y'_x = f(x)y^2 - f(x)g(x)y + g'_x(x).$$

Riccati equation, special case 16.

Particular solution: $y_0 = g(x)$.

The general solution can be written as:

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

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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