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12. $y'_x = -(n+1)x^n y^2 + x^{n+1} f(x)y - f(x)$.

Riccati equation, special case 6.

Particular solution: $y_0 = x^{-n-1}$.

The general solution can be written as:

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

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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