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13. $xy'_x = f(x)y^2 + ny + ax^{2n}f(x)$.

Riccati equation, special case 7.

Solution:

$$y = \begin{cases} \sqrt{a} x^n \tan \left[\sqrt{a} \int x^{n-1} f(x) dx + C \right] & \text{if } a > 0, \\ \sqrt{|a|} x^n \tanh \left[-\sqrt{|a|} \int x^{n-1} f(x) dx + C \right] & \text{if } a < 0, \end{cases}$$

where 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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