

23.
$$xy_{xx}'' = ny_x' + x^{2n+1}f(y)$$
.

 1° . Solution for $n \neq -1$:

$$\int \left[C_1 + 2 \int f(y) \, dy \right]^{-1/2} dy = \pm \frac{x^{n+1}}{n+1} + C_2,$$

where C_1 and C_2 are arbitrary constants.

 2° . Solution for n = -1:

$$\int \left[C_1 + 2 \int f(y) \, dy \right]^{-1/2} dy = \pm \ln|x| + C_2.$$

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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http://eqworld.ipmnet.ru/en/solutions/ode/ode0323.pdf