



**9.  $xy''_{xx} + ay'_x + bx^n y = 0.$**

If  $n = -1$  and  $b = 0$ , we have the Euler equation 2.12. If  $n \neq -1$  and  $b \neq 0$ , the solution is expressed in terms of Bessel functions:

$$y = x^{\frac{1-a}{2}} \left[ C_1 J_\nu \left( \frac{2\sqrt{b}}{n+1} x^{\frac{n+1}{2}} \right) + C_2 Y_\nu \left( \frac{2\sqrt{b}}{n+1} x^{\frac{n+1}{2}} \right) \right], \quad \text{where } \nu = \frac{|1-a|}{n+1},$$

$C_1$  and  $C_2$  are arbitrary constants.

### References

**Kamke, E.**, *Differentialgleichungen: Lösungsmethoden und Lösungen, I, Gewöhnliche Differentialgleichungen*, B. G. Teubner, Leipzig, 1977.

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