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Second-Order Nonlinear Ordinary Differential Equations > Second-Order Autonomous Differential Equation

1. $y''_{xx} = f(y)$.

Second-order autonomous equation.

Solution:

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

where C_1 and C_2 are arbitrary constants.

Particular solutions: $y = A_k$, where A_k are roots of the algebraic (transcendental) equation $f(A_k) = 0$.

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.

Second-Order Autonomous Differential Equation

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