

EqWorld

10.
$$y_x^{(2n)} = a^{2n}y$$
.

Solution:

$$y = C_1 e^{ax} + C_2 e^{-ax} + \sum_{k=1}^{n-1} e^{\varphi_k} (A_k \cos \theta_k + B_k \sin \theta_k),$$

where $\varphi_k = ax \cos \frac{k\pi}{n}$, $\theta_k = ax \sin \frac{k\pi}{n}$; C_1, C_2, A_k, B_k (k = 1, 2, ..., n-1) are arbitrary constants.

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/ode0410.pdf