



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 ($k = 1, 2, \dots, n-1$) 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.