4. $\displaystyle\int_0^b \frac{y(t)}{|x^\lambda - t^\lambda|^k}\,dt = f(x), \qquad 0 < k < 1, \quad \lambda > 0.$

Solution:

$$y(x) = -Ax^{\frac{\lambda(k-1)}{2}}\frac{d}{dx}\left[\int_x^b \frac{t^{\frac{\lambda(3-2k)-2}{2}}\,dt}{(t^\lambda - x^\lambda)^{\frac{1-k}{2}}}\int_0^t \frac{s^{\frac{\lambda(k+1)-2}{2}}f(s)\,ds}{(t^\lambda - s^\lambda)^{\frac{1-k}{2}}}\right],$$

$$A = \frac{\lambda^2}{2\pi}\cos\left(\frac{\pi k}{2}\right)\Gamma(k)\left[\Gamma\left(\frac{1+k}{2}\right)\right]^{-2},$$

where $\Gamma(k)$ is the gamma function.

Reference

Polyanin, A. D. and Manzhirov, A. V., *Handbook of Integral Equations*, CRC Press, Boca Raton, 1998.

