14. $\displaystyle\int_{-a}^{a}\left(\ln\frac{A}{|x-t|}\right)y(t)\,dt = f(x), \qquad -a \le x \le a.$

Solution for $0 < a < 2A$:

$$y(x) = \frac{1}{2M'(a)}\left[\frac{d}{da}\int_{-a}^{a} w(t,a)f(t)\,dt\right]w(x,a)$$
$$-\frac{1}{2}\int_{|x|}^{a} w(x,\xi)\frac{d}{d\xi}\left[\frac{1}{M'(\xi)}\frac{d}{d\xi}\int_{-\xi}^{\xi} w(t,\xi)f(t)\,dt\right]d\xi$$
$$-\frac{1}{2}\frac{d}{dx}\int_{|x|}^{a}\frac{w(x,\xi)}{M'(\xi)}\left[\int_{-\xi}^{\xi} w(t,\xi)\,df(t)\right]d\xi,$$

where the prime stands for the derivative and

$$M(\xi) = \left(\ln\frac{2A}{\xi}\right)^{-1}, \qquad w(x,\xi) = \frac{M(\xi)}{\pi\sqrt{\xi^2 - x^2}},$$

References

Gohberg, I. C. and Krein, M. G., *The Theory of Volterra Operators in a Hilbert Space and Its Applications* [in Russian], Nauka, Moscow, 1967.

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

