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$$4. \quad y(x) - \lambda \int_0^1 \left(\frac{1}{t-x} - \frac{1}{x+t-2xt} \right) y(t) dt = f(x), \quad 0 < x < 1.$$

Tricomi's equation (Tricomi's integral equation). In the equation and its solutions, singular integrals are understood in the sense of the Cauchy principal value.

Solution:

$$y(x) = \frac{1}{1 + \lambda^2 \pi^2} \left[f(x) + \int_0^1 \frac{t^\alpha (1-x)^\alpha}{x^\alpha (1-t)^\alpha} \left(\frac{1}{t-x} - \frac{1}{x+t-2xt} \right) f(t) dt \right] + \frac{C(1-x)^\beta}{x^{1+\beta}},$$
$$\alpha = \frac{2}{\pi} \arctan(\lambda\pi) \quad (-1 < \alpha < 1), \quad \tan \frac{\beta\pi}{2} = \lambda\pi \quad (-2 < \beta < 0),$$

where C is an arbitrary constant.

References

Zabreyko, P. P., Koshelev, A. I., et al., *Integral Equations: A Reference Text*, Noordhoff Int. Publ., Leyden, 1975.

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