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GREEN'S FUNCTIONS FOR PROBLEMS WITH NONLOCAL BOUNDARY CONDITIONS

SVETLANA ROMAN and ARTŪRAS ŠTIKONAS

Institute of Informatics and Mathematics Akademijos 4, LT-08663, Vilnius, Lithuania E-mail: svetlana.roman@ktl.mii.lt E-mail: ash@ktl.mii.lt

We analyze Green's functions for the stationary differential problem

$$Lu := -(p(x)u')' + q(x)u = f(x)$$
(1)

where $p(x) \ge p_0 > 0$, $p \in C^1[0, 1]$, $q \in C[0, 1]$, with nonlocal boundary conditions

$$\langle l_0, u \rangle = \gamma_0 \langle k_0, u \rangle, \tag{2}$$

$$\langle l_1, u \rangle = \gamma_1 \langle k_1, u \rangle, \tag{3}$$

where $\langle l_i, u \rangle := \langle l_i(x), u(x) \rangle$ is the classical part and $\langle k_i, u \rangle := \langle k_i(x), u(x) \rangle$, i = 0, 1, is the nonlocal part of these conditions.

We find Green's functions for problems with various types of conditions, using the general formula that we have obtained for problem (1)-(3). For example, the classical part of conditions can be

$$\langle l_i, u \rangle = \alpha_i u'(i) + \beta_i u(i), \text{ where } |\alpha_i| + |\beta_i| > 0, \ i = 0, 1,$$

and the nonlocal part can be

$$\langle k_i, u \rangle = \sum_{j=1}^{N} (\delta_{ij} u'(\xi_{ij}) + \gamma_{ij} u(\xi_{ij})) \quad \text{or} \quad \langle k_i, u \rangle = \gamma_i \int_0^1 \rho_i(t) u(t) \, dt$$

where $\rho_i(t)$, i = 0, 1, are weight functions.

REFERENCES

- [1] R.Y. Ma. A survey on nonlocal boundary value problems. Appl. Math. E-Notes, 7, 2007, 257 279.
- [2] Y. Sun. Eigenvalues and symmetric positive solutions for a three-point boundary-value problem. Electronic Journal of Differential Equations, 2005(127), 2005, 1 – 7.
- [3] V.S. Vladimirov. Equations of Mathematical Physics. Marcel Dekker, 1971.
- [4] Z. Zhao. Positive solutions for singular three-point boundary-value problems. Electronic Journal of Differential Equations, 2007(156), 2007, 1 – 8.