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Vallée-Poussin theorem for fractional functional differential equations

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An analog of the classical Vallée-Poussin theorem about differential inequality in the theory of ordinary differential equations is developed for fractional functional differential equations. The main results are obtained in a form of a theorem about several equivalent assertions. Among them solvability of two-point boundary value problems with fractional functional differential equation, negativity of Green's function, and its derivatives and existence of a function $v(t)$ satisfying a corresponding differential inequality. Thus the Vallée-Poussin theorem presents one of the possible "entrances" to assertions on nonoscillating properties and assertions about the negativity of Green's functions and their derivatives for various two-point problems. Choosing the function $v(t)$ in the condition, we obtain explicit tests of sign-constancy of Green's functions and their derivatives. It can be stressed that a choice of a corresponding function in the Vallée-Poussin theorem leads to explicit criteria in the form of algebraic inequalities, which, as we demonstrate with examples, cannot be improved.