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In this paper, we present some Lyapunov-type inequalities for differential equations of order α , $3 < \alpha \leq 4$ defined in terms of Riemann-Liouville and Caputo derivatives. We consider several mixed boundary conditions. We obtain fractional Green's functions for the corresponding boundary value problems, and use maximum norm and some properties of the Green's functions to obtain the Lyapunov-type inequalities. We use these inequalities in two applications; first, to find lower bounds for the lowest eigenvalues, and second, to find the domains in which certain combination of Mittag-Leffler functions have no zeros. We further use the Cauchy-Schwarz inequality to improve the lower bounds for the smallest eigenvalues and stretch the domains in which certain combinations of Mittag-Leffler functions have no real zeros. We present here results for only a few integer order boundary conditions. We plan to present results for several other integer and fractional boundary conditions (including mixed and Robin boundary conditions) somewhere else.

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