Sign-constancy of Green's Functions for Two-point Boundary Value Problems with Second Order Impulsive Delayed Differential Equations

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We consider the following second order impulsive differential equation with delays

$$(Lx)(t) \equiv x''(t) + \sum_{j=1}^{p} a_j(t)x'(t-\tau_j(t)) + \sum_{j=1}^{p} b_j(t)x(t-\theta_j(t)) = f(t), \quad t \in [0,\omega], \tag{1}$$

$$\begin{aligned} &x(t_k) = \gamma_k x(t_k - 0), \quad x'(t_k) = \delta_k x'(t_k - 0), \quad k = 1, 2, ..., r, \\ &0 = t_0 < t_1 < t_2 < ... < t_r < t_{r+1} = \omega, \end{aligned} \tag{2}$$

$$x(\zeta) = 0, \quad \zeta < 0, \tag{3}$$

For equation (1) we consider the following variants of boundary conditions:

$$x(0) = 0, \quad x(\omega) = 0, \tag{4}$$

$$x'(0) = 0, \quad x(\omega) = 0, \tag{5}$$

$$x(0) = 0, \quad x'(\omega) = 0, \tag{6}$$

$$x'(0) = 0, \quad x'(\omega) = 0. \tag{7}$$

In our talk we obtain sufficient conditions of nonpositivity of Green's functions for impulsive differential equation without an assumption about the sign of $b_j(t)$. All results are formulated in the form of theorems about differential inequalities. Then choosing the test functions, we obtain explicit conditions of nonpositivity of Green's functions.

Keywords: second order impulsive differential equations; boundary value problems; sign-constancy of Green's functions