When $G'_i(\tau_i) = 0$, $a_i V'_i(\tau_i) = -\Pi'_i(\tau_i)$.

$$G''_i(\tau_i) = P_i(\tau_i)^{-\alpha} r''_i(\tau_i) - \alpha r'_i(\tau_i) P_i(\tau_i)^{-\alpha} A(\tau_i) - \alpha V'_i(\tau_i) A(\tau_i) - \alpha V_i(\tau_i) A'(\tau_i)$$