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Differential transform method for an immunology model of HIV

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Human Immunodeficiency Virus (HIV) mainly attacks a person's immune system. The virus destroys $CD4^{+}T$ cells, which mainly fight against the infection. As a result, the probability of facing the risk of various deadly infections increases and sometimes it leads to a cancer due to the weakening of the immune system. The main objective of the research is to solve a system of ordinary differential equations for a dynamic model of HIV using semi numerical analytical method, namely differential transform method (DTM). The solutions, which were obtained from DTM were compared with the solutions of modified Euler method and forth order Runge Kutta (RK4) method. Moreover, Pade approximation was applied for DTM. Pade approximated solutions were obtained by using a limited number of coefficients of solutions of power series given by DTM. The results of the research show that DTM is an efficient method to solve systems of nonlinear ordinary differential equation such as dynamic model of HIV. The solutions well behaved for small time intervals. Hence, the Pade approximation was applied with DTM in order to obtain accurate solutions for large time intervals.

Keywords: $CD4^{+}T$ cells, Differential transform method, Human Immunodeficiency Virus, Human Immunodeficiency Virus, Runge Kutta Method