

## **Fourth Order Four-Stage Diagonally Implicit Runge-Kutta Method for Linear Ordinary Differential Equations**

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### **ABSTRACT**

A new fourth order four-stage Diagonally Implicit Runge-Kutta (DIRK) method which is specially designed for the integration of Linear Ordinary Differential Equations (LODEs) is constructed. In the derivation, Butcher's error equations are used but one of the error equations can be eliminated due to the property of the LODE itself. The stability aspect of the method is investigated and it is found to have a bigger region of stability compared to explicit Runge-Kutta (ERK) method of the same type (designed for the integration of LODE). A set of test problems are used to validate the method and numerical results show that the method produced smaller global error compared to ERK method.