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# NASA TECH BRIEF

*NASA Pasadena Office*



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## Variable Order Integrators for the Numerical Solution of Ordinary Differential Equations

### The problem:

To integrate systems of ordinary differential equations.

### The solution:

A series of computer subroutines which integrate systems of ordinary differential equations and may also be used for numerical quadrature. SVDQ is a single precision subroutine, and DVDQ is double precision. VODQ keeps the derivative and performs most of the calculations in single precision, and accumulates the independent and dependent variables in double precision.

### How it's done:

The subroutines use linear multistep predictor-corrector formulas of the Adams type, with formulas available for treating directly differential equations of orders 1 to 4. The subroutine automatically selects the integration orders (which may be different for different equations in the system) and the stepsize. The integration orders are selected so as to maximize the stepsize while maintaining numerical stability and meeting the user's requested local accuracy. Special returns are available based on the

number of steps, the value of the independent variable, values of dependent variables, and values of user defined auxiliary functions.

### Notes:

1. This program is written in FORTRAN IV and FORTRAN V for use on the IBM-7094 (IBSYS) computer or the UNIVAC-1108 (EXEC 8) computer.
2. Requests for further information may be directed to:

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### Patent status:

No patent action is contemplated by NASA.

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