
Time: ____________________ minutes.

G.D. Byrne and R. J. Lambert

Name of Author:

Iowa State University

Institution:

Ames, Iowa

Address:

Member of Mathematical Association of America: Yes [☑] No [☐]
ABSTRACT

The abstract should be in the form of a brief and concise statement of the main results or points of view of the paper, without demonstrations and with a minimum of formulae. It should not exceed 100 words and should be compressed if possible into a single paragraph. It should be written in the third person. The abstract should be typewritten and in a form suitable for immediate publication in the MONTHLY.

Suppose it is required that a particular solution to the differential equation

$$\frac{dy}{dx} = F(x, y)$$

be found. Suppose further that the points \((x_{n-1}, y_{n-1})\) and \((x_n, y_n)\) lie on the particular solution curve and that they are given. Let \(x_{n+1} = x_n + h\), \(y_{n+1} = y_n + k\). Here \(h\), the step-size is fixed. Therefore, \(k\), the change in \(y\), must be evaluated to find the next point, \((x_{n+1}, y_{n+1})\), on the particular solution curve. The set of equations

\[
\begin{align*}
(1) & \quad k_0^{(n-1)} = hF(x_{n-1}, y_{n-1}), \\
(2) & \quad k_1^{(n-1)} = hF(x_{n-1} + uh, y_{n-1} + uk_0^{(n-1)}), \\
(3) & \quad k_0^{(n)} = hF(x_n, y_n), \\
(4) & \quad k_1^{(n)} = hF(x_n + uh, y_n + uk_0^{(n)}), \\
(5) & \quad k^{(n)} = a_0k_0^{(n)} + a_1k_1^{(n)} + b_0k_0^{(n-1)} + b_1k_1^{(n-1)}, \\
(6) & \quad y_{n+1} = y_n + k^{(n)}, \\
(7) & \quad b_0 = \frac{5-6u}{12u}, \quad (8) \quad b_1 = \frac{5}{12u} \\
(9) & \quad a_0 = \frac{16u-5}{12u}, \quad (10) \quad a_1 = \frac{5}{12u},
\end{align*}
\]

describes a modified Runge-Kutta method of numerical integration, which has an accuracy of the order of \(h^5\) and which requires only two substitutions into the differential equation for each step of integration. The value of \(u\) is dependent upon \(h\) and the differential equation.