Runge-Kutta Third Order Method Version 1

This method is a third order Runge-Kutta method for approximating the solution of the initial value problem $y'(x) = f(x,y)$; $y(x_0) = y_0$ which evaluates the integrand, $f(x,y)$, three times per step. For step $i+1$,

$$y_{i+1} = y_i + 1/6 \, (k_1 + 4 \, k_2 + k_3),$$

where

$$k_1 = h \, f(x_i, \, y_i),$$

$$k_2 = h \, f(x_i + h / 2, \, y_i + k_1 / 2),$$

$$k_3 = h \, f(x_i + h, \, y_i - k_1 + 2 \, k_2),$$

and $x_i = x_0 + i \, h$.

This method is a third order procedure for which Richardson extrapolation can be used.