9.3.4 4th order Runge-Kutta Method (RK4)

MO2.7

The most popular form of a fourth-order ($p = 4$) accurate Runge-Kutta method is:

$$\underline{a} = \Delta t \underline{f}\left(\underline{v}^n, t^n\right) \tag{9.10}$$

$$\underline{b} = \Delta t \underline{f}\left(\underline{v}^n + \underline{a}/2, t^n + \Delta t/2\right) \tag{9.11}$$

$$\underline{c} = \Delta t \underline{f}\left(\underline{v}^n + \underline{b}/2, t^n + \Delta t/2\right) \tag{9.12}$$

$$\underline{d} = \Delta t f\left(\underline{v}^n + \underline{c}, t^n + \Delta t\right) \tag{9.13}$$

$$\underline{v}^{n+1} = \underline{v}^n + \frac{1}{6}(\underline{a} + 2\underline{b} + 2\underline{c} + \underline{d}) \tag{9.14}$$

Note that this method requires four evaluations of $\boldsymbol{f}$

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