

The methods we have seen so far are all representatives of a large class of one-step methods known as Runge-Kutta (RK) methods:

$$k_i = f(t_j + c_i \cdot h, y_j + h \cdot \sum_{l=1}^s a_{il} \cdot k_l)$$

$$y_{j+1} = y_j + h \cdot \sum_{i=1}^s b_i \cdot k_i$$

where:

- $s$  ... number of stages
- $c_i$  ... nodes
- $b_i$  ... weights
- $a_{il}$  ... RK matrix
- $k_i$  ... slopes

It's convenient to write RK methods with a so-called Butcher tableau (BT):

$$\begin{array}{c|cccc}
 c_1 & a_{11} & a_{12} & \dots & a_{1s} \\
 c_2 & a_{21} & a_{22} & \dots & a_{2s} \\
 \vdots & \vdots & \vdots & & \vdots \\
 c_s & a_{s1} & a_{s2} & \dots & a_{ss} \\
 \hline
 & b_1 & b_2 & \dots & b_s
 \end{array}
 = \begin{array}{c|c}
 \vec{c} & A \\
 \hline
 & \vec{b}^T
 \end{array}$$