Table 2.1 Summary of methods for the solution of ordinary differential equations. The second- and third-order Runge–Kutta methods are low-storage variants; $h = \Delta t$

Method	Order	Formulae
Forward	1	$\phi_{n+1} = \phi_n + hF(\phi_n)$
Backward	1	$\phi_{n+1} = \phi_n + hF(\phi_{n+1})$
Asselin leapfrog	1	$\phi_{n+1} = \overline{\phi_{n-1}} + 2hF(\phi_n)$, $\overline{\phi_n} = \phi_n + \gamma(\overline{\phi_{n-1}} - 2\phi_n + \phi_{n+1})$
Leapfrog	2	$\phi_{n+1} = \phi_{n-1} + 2hF(\phi_n)$
Adams–Bashforth	2	$\phi_{n+1} = \phi_n + \frac{h}{2}[3F(\phi_n) - F(\phi_{n-1})]$
Trapezoidal	2	$\phi_{n+1} = \phi_n + \frac{h}{2}[F(\phi_{n+1}) + F(\phi_n)]$
Runge–Kutta (2-step explicit)	2	$q_1 = hF(\phi_n)$, $\phi_1 = \phi_n + q_1$, $q_2 = hF(\phi_1) - q_1$, $\phi_{n+1} = \phi_1 + q_2/2$
Magazenkov	2	$\phi_n = \phi_{n-2} + 2hF(\phi_{n-1})$ $\phi_{n+1} = \phi_n + \frac{h}{2}[3F(\phi_n) - F(\phi_{n-1})]$
Leapfrog–trapezoidal	2	$\phi_1 = \phi_{n-1} + 2hF(\phi_n)$, $\phi_{n+1} = \phi_n + \frac{h}{2}[F(\phi_1) + F(\phi_n)]$
Adams–Bashforth	3	$\phi_{n+1} = \phi_n + \frac{h}{12}[23F(\phi_n) - 16F(\phi_{n-1}) + 5F(\phi_{n-2})]$
Adams–Moulton	3	$\phi_{n+1} = \phi_n + \frac{h}{12}[5F(\phi_{n+1}) + 8F(\phi_n) - F(\phi_{n-1})]$
Adams–Bashforth–Moulton predictor corrector	3	$\phi_1 = \phi_n + \frac{h}{2}[3F(\phi_n) - F(\phi_{n-1})]$, $\phi_{n+1} = \phi_n + \frac{h}{12}[5F(\phi_1) + 8F(\phi_n) - F(\phi_{n-1})]$
Runge–Kutta (3-step explicit)	3	$q_1 = hF(\phi_n)$, $\phi_1 = \phi_n + q_1/3$, $q_2 = hF(\phi_1) - 5q_1/9$, $\phi_2 = \phi_1 + 15q_2/16$, $q_3 = hF(\phi_2) - 153q_2/128$, $\phi_{n+1} = \phi_2 + 8q_3/15$
Runge–Kutta (4-step explicit)	4	$q_1 = hF(\phi_n)$, $q_2 = hF(\phi_n + q_1/2)$, $q_3 = hF(\phi_n + q_2/2)$, $q_4 = hF(\phi_n + q_3)$, $\phi_{n+1} = \phi_n + (q_1 + 2q_2 + 2q_3 + q_4)/6$