

If temporal term is discretized with three-time-level method, we get

$$\frac{V}{2\Delta t}(3q^{n+1} - 4q^n + q^{n-1}) = -\sum R(q^{n+1}). \quad (1)$$

Add $\frac{V}{2\Delta t}q^n$ to both sides:

$$\frac{V}{2\Delta t}(3q^{n+1} - 4q^n + q^{n-1}) + \frac{V}{2\Delta t}q^n = -\sum R(q^{n+1}) + \frac{V}{2\Delta t}q^n. \quad (2)$$

Regroup to get

$$\frac{3V}{2\Delta t}(q^{n+1} - q^n) = -\sum R(q^{n+1}) + \frac{V}{2\Delta t}(q^n - q^{n-1}). \quad (3)$$

Define $\Delta q = q^{n+1} - q^n$ to get

$$\frac{3V}{2\Delta t}\Delta q = -\sum R(q^{n+1}) + \frac{V}{2\Delta t}(q^n - q^{n-1}). \quad (4)$$