D2.4.2 cont. Check the first relation first $\Rightarrow$ 3/3

$$(t^{n+1})^3 \stackrel{?}{=} (t^n)^3 + h\Big[3(t^{n+1})^2 + (-\tfrac{1}{2})(6ht^{n+1} - 3h^2)$$

$$+ (-\tfrac{1}{12})\,6h^2\Big]$$

$$(t^{n+1})^3 \stackrel{?}{=} (t^n)^3 + h\left[3(t^{n+1})^2 - 3ht^{n+1} + h^2\right]$$

$$(t^{n+1})^3 \stackrel{?}{=} (t^{n+1}-h)^3 + 3h(t^{n+1})^2 - 3h^2t^{n+1} + h^3$$

$$(t^{n+1})^3 \stackrel{?}{=} (t^{n+1})^3 \boxed{\begin{array}{l} -3(t^{n+1})^2h + 3(t^{n+1})h^2 - h^3 \\ +3(t^{n+1})^2h - 3(t^{n+1})h^2 + h^3 \end{array}}$$ These cancel

So the corrector works. For the predictor, we find

$$(t^{n+1})^3 \stackrel{?}{=} (t^n)^3 + h\left[3(t^n)^2 + (\tfrac{1}{2})(6ht^n - 3h^2) + (\tfrac{5}{12})\,6h^2\right]$$

$$(t^{n+1})^3 \stackrel{?}{=} (t^n)^3 + 3(t^n)^2h + 3t^nh^2 + h^3$$

or

$$(t^n+h)^3 \stackrel{?}{=} (t^n)^3 + 3(t^n)^2h + 3t^nh^2 + h^3$$

This relation is evidently also correct. So the predictor also works.