

FromCoefficientRules [

CoefficientRules [z2[[4]], {c, u, w}] /.

{ (e_ -> a_) :-> (e -> Simplify[a]) }, {c, u, w}]

$$\frac{(1-t+t^2)^2 (-1+2t-3t^2+2t^3)}{t^3} - \frac{c (1-t+t^2)^3 (4+t-5t^2-t^3+t^4)}{2t^4} - \frac{(1-t+t^2)^3 (-4-5t+t^3) u w}{2t^4}$$