

HW #1

Problem 6

Ryan St. Pierre

> restart

Helpful functions

> with(inttrans) :

> u := t → Heaviside(t) :

> PAR := (Za, Zb) → simplify($\frac{Za \cdot Zb}{Za + Zb}$) :

> SCS := X → sort(collect(simplify(expand(numer(X)) / expand(denom(X))), s), s) :

> IL := (X, s, t) → simplify(convert(invlaplace(convert(X, parfrac, s), s, t), expsincos)) :

> ILTS := (X, s, t) → simplify(convert(invlaplace(X, s, t), expsincos)) :

> eq1 := (m1 · s² + (c1 + c2) · s + K2 + K3) · X1 - K3 · X2 - c1 · X3 = 0
eq1 := (m1 s² + (c1 + c2) s + K2 + K3) X1 - K3 X2 - c1 X3 = 0 (1)

> eq2 := (m2 · s² + c3 · s + K3) · X2 - K3 · X1 - c3 · X3 = F
eq2 := (m2 s² + c3 s + K3) X2 - K3 X1 - c3 X3 = F (2)

> eq3 := (m3 · s² + (c1 + c3) · s + K1) · X3 - c1 · X1 - c3 · X2 = 0
eq3 := (m3 s² + (c1 + c3) s + K1) X3 - c1 X1 - c3 X2 = 0 (3)

> sol := solve({eq1, eq2, eq3}, [X1, X2, X3]) :

> TF := simplify($\frac{\text{rhs(sol[][3])}}{F}$)

TF := (c3 m1 s² + c3 (c1 + c2) s + (K2 + K3) c3 + K3 c1) / (m1 m2 m3 s⁶ + (m1 (m2 + m3) c3 + m2 ((m1 + m3) c1 + c2 m3)) s⁵ + (c3² m1 + ((m1 + m2 + m3) c1 + c2 (m2 + m3)) c3 + c1² m2 + c1 c2 m2 + m3 (m1 + m2) K3 + m2 (m1 K1 + m3 K2)) s⁴ + ((c1 + c2) c3² + (c1² + c2 c1 + (m1 + m2 + m3) K3 + m3 K2 + m1 K1 + K2 m2) c3 + ((m1 + m2 + m3) K3 + m2 (K1 + K2)) c1 + c2 (m2 K1 + K3 m3)) s³ + ((K2 + K3 - m1) c3² + ((K1 + K2 + 2 K3) c1 + c2 (K1 + K3)) c3 + (K3 - m2) c1² + K3 c1 c2 + (m1 K1 + m2 K1 + m3 K2) K3 + m2 K1 K2) s² + ((-c1 - c2) c3² + (-c1² + (K1 + K2) K3 + K1 K2) c3 + ((K1 + K2) c1 + c2 K1) K3) s + (-K2 - K3) c3² - 2 K3 c1 c3 + K3 (K1 K2 - c1²)) (4)

>