

> restart

>

$$\frac{d^3 y}{dt^3} - 2 \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} - 6y = 2 \cos(3t) \quad \begin{matrix} y(0) = 2 \\ y'(0) = -2 \\ y''(0) = 4 \end{matrix}$$

LODE(3) c.c. NH.

> Equa := diff(y(t), t\$3) - 2*diff(y(t), t\$2) + 4*diff(y(t), t) - 6*y(t) = 2*cos(3 t)

$$\text{Equa} := \frac{d^3}{dt^3} y(t) - 2 \left(\frac{d^2}{dt^2} y(t) \right) + 4 \left(\frac{d}{dt} y(t) \right) - 6 y(t) = 2 \cos(3 t) \quad (1)$$

> InitCond := y(0) = 2, D(y)(0) = -2, D(D(y))(0) = 4

$$\text{InitCond} := y(0) = 2, D(y)(0) = -2, D^{(2)}(y)(0) = 4 \quad (2)$$

> with(inttrans) :

> LapTransEqua := subs(InitCond, laplace(Equa, t, s))

$$\begin{aligned} \text{LapTransEqua} := & s^3 \text{laplace}(y(t), t, s) - 16 + 6s - 2s^2 - 2s^2 \text{laplace}(y(t), t, s) \\ & + 4s \text{laplace}(y(t), t, s) - 6 \text{laplace}(y(t), t, s) = \frac{2s}{s^2 + 9} \end{aligned} \quad (3)$$

> LapTransSol := simplify(isolate(LapTransEqua, laplace(y(t), t, s)))

$$\text{LapTransSol} := \text{laplace}(y(t), t, s) = \frac{2(-26s + 17s^2 + 72 - 3s^3 + s^4)}{(s^2 + 9)(s^3 - 2s^2 + 4s - 6)} \quad (4)$$

> Fract := expand(2(-26s + 17s^2 + 72 - 3s^3 + s^4)) / ((s^2 + 9)(s^3 - 2s^2 + 4s - 6))

$$\text{Fract} := \frac{-52s + 34s^2 + 144 - 6s^3 + 2s^4}{(s^2 + 9)(s^3 - 2s^2 + 4s - 6)} \quad (5)$$

> Roo := solve((s^3 - 2s^2 + 4s - 6), s) : evalf(%)

$$1.711345740, 0.1443271303 + 1.866864334 I, 0.1443271303 - 1.866864334 I \quad (6)$$

> SecondFrac := (-52s + 34s^2 + 144 - 6s^3 + 2s^4) / ((s*2 + 9)*(s - Roo1)*(s - Re(Roo2))*2 + Im(Roo2)*2) : evalf(%, 5)

$$\frac{-52.s + 34.s^2 + 144. - 6.s^3 + 2.s^4}{(s^2 + 9.) (s - 1.7114) ((s - 0.14431)^2 + 3.4852)} \quad (7)$$

> PartFrac := -52s + 34s^2 + 144 - 6s^3 + 2s^4 = expand((A*s + B)*(s^3 - 2s^2 + 4s - 6) + C*(s^2 + 9)*(s - 0.14431)^2 + 3.4852) + (D*s + E)*(s*2 + 9)*(s - 1.7114))

$$\begin{aligned} \text{PartFrac} := & -52s + 34s^2 + 144 - 6s^3 + 2s^4 = A s^4 - 2A s^3 + 4A s^2 - 6A s + B s^3 - 2B s^2 \\ & + 4B s - 6B + C s^4 - 0.28862 C s^3 + 12.50602538 C s^2 - 2.59758 C s + 31.55422838 C \\ & + D s^4 - 1.7114 D s^3 + 9 D s^2 - 15.4026 D s + E s^3 - 1.7114 E s^2 + 9 E s - 15.4026 E \end{aligned} \quad (8)$$

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> System := A + C + D = 2, -2 A + B - 0.28862 C - 1.7114 D + E = -6, + 4 A - 2 B
+ 12.50602538 C + 9 D - 1.7114 E = 34, -6 A + 4 B - 2.59758 C - 15.4026 D + 9 E =
-52, -6 B + 31.55422838 C - 15.4026 E = 144 : System1; System2; System3; System4;
System5
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$$\begin{aligned} A + C + D &= 2 \\ -2 A + B - 0.28862 C - 1.7114 D + E &= -6 \\ 4 A - 2 B + 12.50602538 C + 9 D - 1.7114 E &= 34 \\ -6 A + 4 B - 2.59758 C - 15.4026 D + 9 E &= -52 \\ -6 B + 31.55422838 C - 15.4026 E &= 144 \end{aligned}$$

(9)

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> Param := solve( {System}, {A, B, C, D, E}) : evalf( Param1, 5); evalf( Param2, 5);
evalf( Param3, 5); evalf( Param4, 5); evalf( Param5, 5)
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$$\begin{aligned} A &= 0.065041 \\ B &= -0.24390 \\ C &= 1.9991 \\ D &= -0.064094 \\ E &= -5.1587 \end{aligned}$$

(10)