

> restart :

>

$$\frac{d^3 x}{dt^3} + 27x = e^{2(t-3)} \cdot u(t-3) \quad \begin{aligned} x(0) &= 4 \\ x'(0) &= -6 \\ x''(0) &= 8 \end{aligned}$$

> DiffEquation := diff(x(t), t\$3) + 27\*x(t) = exp(2\*(t-3)) \* Heaviside(t-3);

$$\text{DiffEquation} := \frac{d^3}{dt^3} x(t) + 27 x(t) = e^{2t-6} \text{Heaviside}(t-3) \quad (1)$$

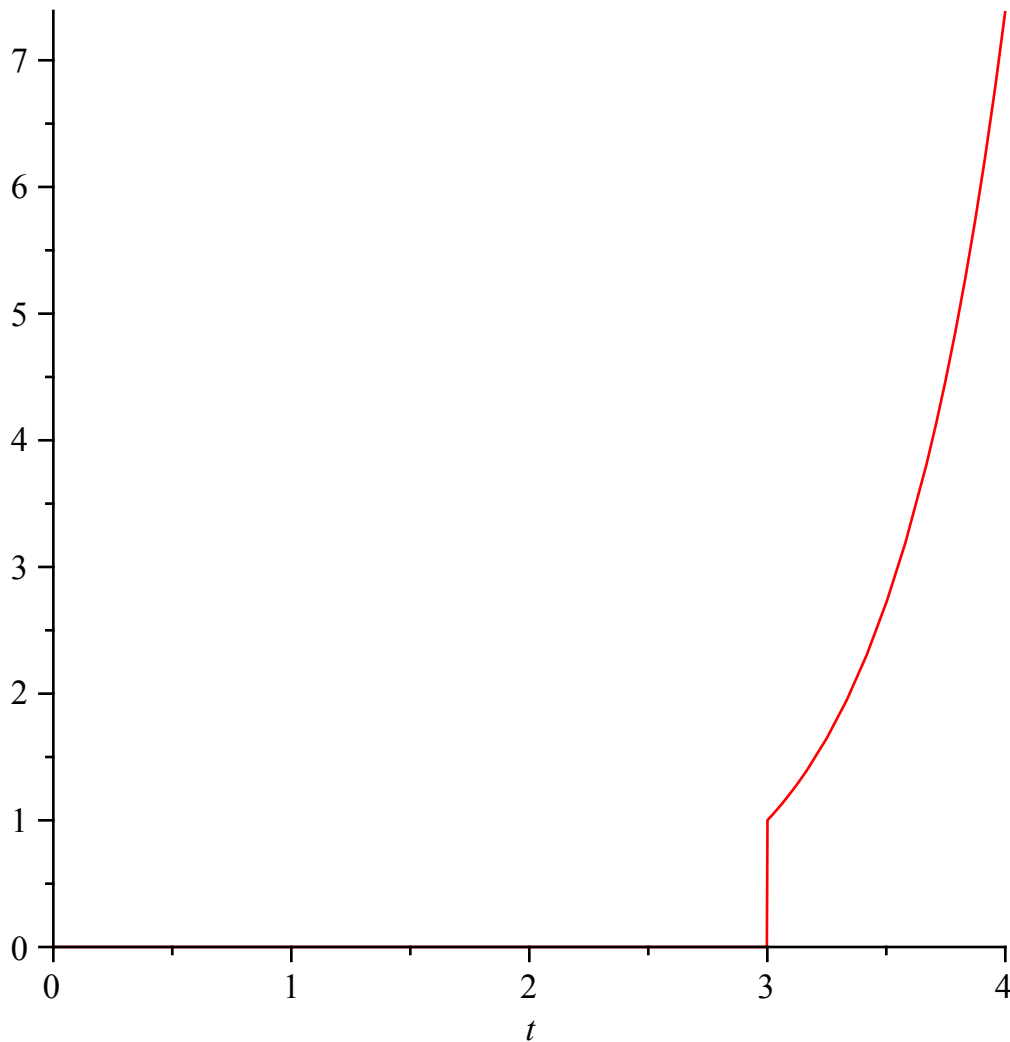
> InitialConditions := x(0) = 4, D(x)(0) = -6, D(D(x))(0) = 8;

$$\text{InitialConditions} := x(0) = 4, D(x)(0) = -6, D^{(2)}(x)(0) = 8 \quad (2)$$

> Q(t) := rhs(DiffEquation);

$$Q(t) := e^{2t-6} \text{Heaviside}(t-3) \quad (3)$$

> plot(Q(t), t=0..4);



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> with(inttrans) :
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> LapTransEquation := subs(InitialConditions, laplace(DiffEquation, t, s));
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$$\text{LapTransEquation} := s^3 \text{laplace}(x(t), t, s) - 8 + 6s - 4s^2 + 27 \text{laplace}(x(t), t, s) = \frac{e^{-3s}}{s-2} \quad (4)$$

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> LapTransSolution := simplify(isolate(LapTransEquation, laplace(x(t), t, s)));
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$$\text{LapTransSolution} := \text{laplace}(x(t), t, s) = \frac{e^{-3s} + 20s - 16 - 14s^2 + 4s^3}{(s-2)(s^3+27)} \quad (5)$$

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> ParticularSolution := invlaplace(LapTransSolution, s, t) : evalf(%, 2);
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$$x(t) = 2.3 e^{-3 \cdot t} - 0.0074 \text{Heaviside}(t-3.) e^{-3 \cdot t+9.} + 0.074 (23. \cos(2.6 t) - 8.5 \sin(2.6 t)) e^{1.5 t} + 0.0011 (-27. e^{2 \cdot t-6.} + 10. (1.7 \sin(2.6 t-7.6) + 2. \cos(2.6 t-7.6)) e^{1.5 t-4.5}) (-1. + \text{Heaviside}(3. - 1. t)) \quad (6)$$

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> plot(rhs(ParticularSolution), t=0..4);
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