

> restart

> Ecua := L·diff(q(t), t\$2) + R·diff(q(t), t) + $\frac{q(t)}{C}$ = E·Heaviside(t - 5)

$$Ecua := L \left(\frac{d^2}{dt^2} q(t) \right) + R \left(\frac{d}{dt} q(t) \right) + \frac{q(t)}{C} = E \text{Heaviside}(t - 5) \quad (1)$$

> Cond := q(0) = 0, D(q)(0) = 0;

$$Cond := q(0) = 0, D(q)(0) = 0 \quad (2)$$

> L := 1; R := 20; C := $\frac{5}{1000}$; E := 150;

$$\begin{aligned} L &:= 1 \\ R &:= 20 \\ C &:= \frac{1}{200} \\ E &:= 150 \end{aligned} \quad (3)$$

> Ecua

$$\frac{d^2}{dt^2} q(t) + 20 \left(\frac{d}{dt} q(t) \right) + 200 q(t) = 150 \text{Heaviside}(t - 5) \quad (4)$$

> with(inttrans) :

> EcuaTrans := subs(Cond, laplace(Ecua, t, s))

$$\begin{aligned} EcuaTrans &:= s^2 \text{laplace}(q(t), t, s) + 20 s \text{laplace}(q(t), t, s) + 200 \text{laplace}(q(t), t, s) \\ &= \frac{150 e^{-5s}}{s} \end{aligned} \quad (5)$$

> SolTrans := isolate(EcuaTrans, laplace(q(t), t, s))

$$SolTrans := \text{laplace}(q(t), t, s) = \frac{150 e^{-5s}}{s (s^2 + 20 s + 200)} \quad (6)$$

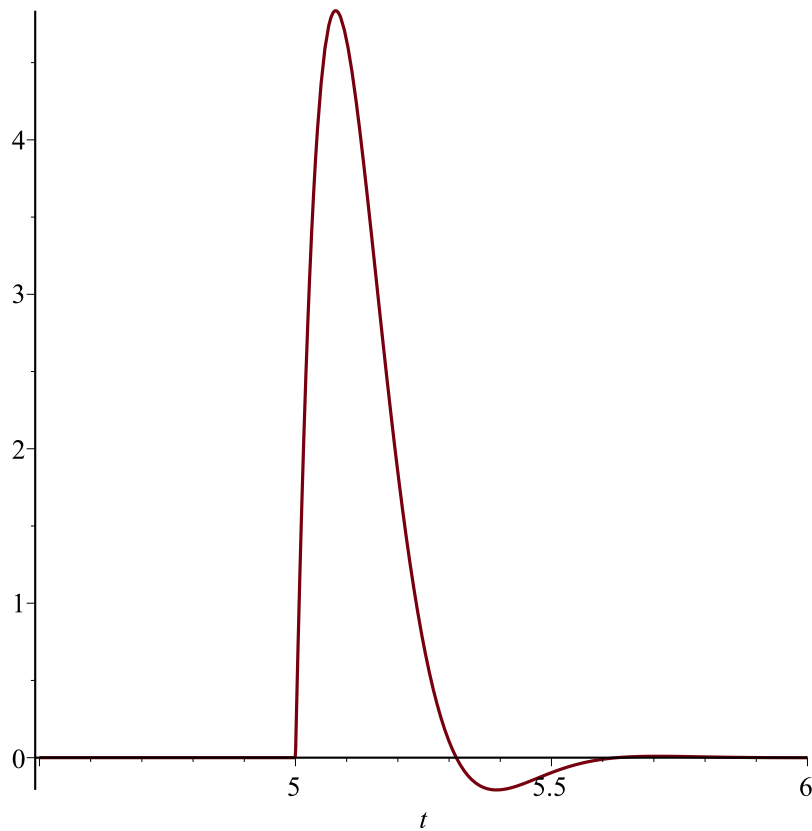
> SolPart := invlaplace(SolTrans, s, t)

$$\begin{aligned} SolPart := q(t) &= \frac{3}{8} \text{Heaviside}(t - 5) (2 + (-1 - I) e^{(-10 - 10 I) (t - 5)} + (-1 \\ &+ I) e^{(-10 + 10 I) (t - 5)}) \end{aligned} \quad (7)$$

> SolPartCorriente := i(t) = rhs(diff(SolPart, t))

$$\begin{aligned} SolPartCorriente := i(t) &= \frac{3}{8} \text{Dirac}(t - 5) (2 + (-1 - I) e^{(-10 - 10 I) (t - 5)} + (-1 \\ &+ I) e^{(-10 + 10 I) (t - 5)}) + \frac{3}{8} \text{Heaviside}(t - 5) (20 I e^{(-10 - 10 I) (t - 5)} \\ &- 20 I e^{(-10 + 10 I) (t - 5)}) \end{aligned} \quad (8)$$

> plot(rhs(SolPartCorriente), t = 4.5 .. 6)

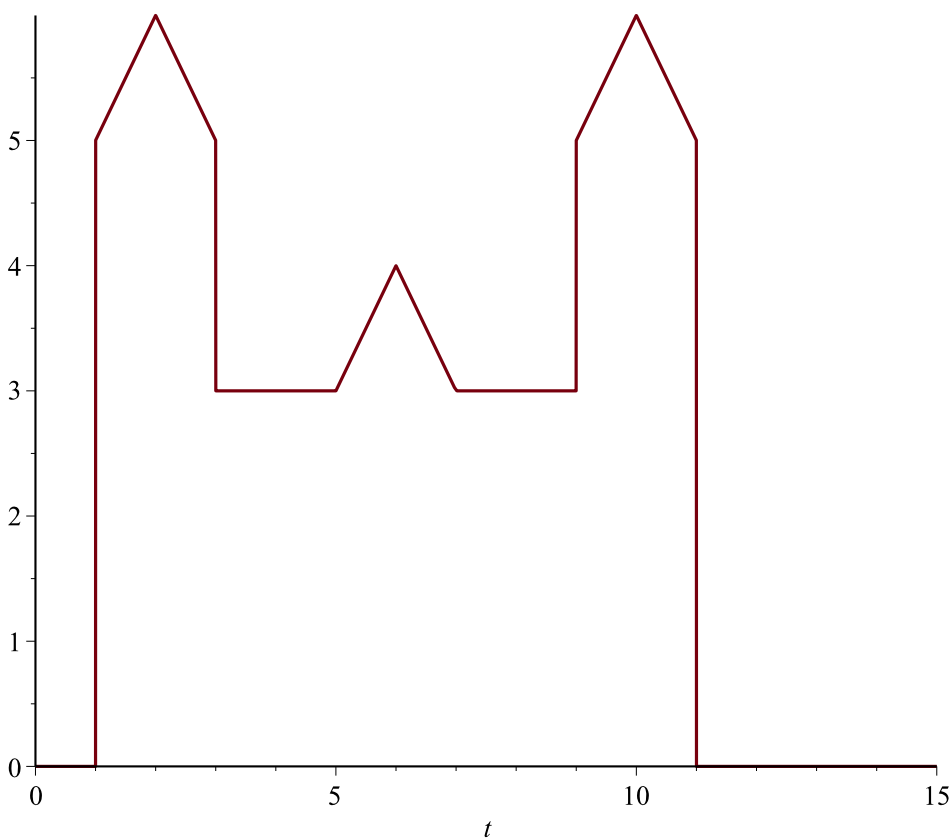


```
> restart
```

```
> f := 5·Heaviside(t - 1) + (t - 1)·Heaviside(t - 1) - 2·(t - 2)·Heaviside(t - 2) + (t - 3)
·Heaviside(t - 3) - 2·Heaviside(t - 3) + (t - 5)·Heaviside(t - 5) - 2·(t - 6)
·Heaviside(t - 6) + (t - 7)·Heaviside(t - 7) + 2·Heaviside(t - 9) + (t - 9)·Heaviside(t
- 9) - 2·(t - 10)·Heaviside(t - 10) + (t - 11)·Heaviside(t - 11) - 5·Heaviside(t
- 11);
```

```
f := 5 Heaviside(t - 1) + (t - 1) Heaviside(t - 1) - 2 (t - 2) Heaviside(t - 2) + (t
- 3) Heaviside(t - 3) - 2 Heaviside(t - 3) + (t - 5) Heaviside(t - 5) - 2 (t
- 6) Heaviside(t - 6) + (t - 7) Heaviside(t - 7) + 2 Heaviside(t - 9) + (t
- 9) Heaviside(t - 9) - 2 (t - 10) Heaviside(t - 10) + (t - 11) Heaviside(t - 11)
- 5 Heaviside(t - 11) (9)
```

```
> plot(f, t = 0..15)
```



```
> with(inttrans) :
> F := laplace(f, t, s)

$$F := \frac{e^{-s} + e^{-11s} - 2e^{-10s} + e^{-9s} + e^{-7s} - 2e^{-6s} + e^{-5s} + e^{-3s} - 2e^{-2s}}{s^2} + \frac{5e^{-s} - 5e^{-11s} + 2e^{-9s} - 2e^{-3s}}{s} \quad (10)$$

```

```
> restart
> Ecua := diff(y(t), t$3) - 6·diff(y(t), t$2) + 11·diff(y(t), t) - 6·y(t) = 0

$$Ecua := \frac{d^3}{dt^3} y(t) - 6 \left( \frac{d^2}{dt^2} y(t) \right) + 11 \left( \frac{d}{dt} y(t) \right) - 6 y(t) = 0 \quad (11)$$

```

```
> CondIniEcua := y(0) = 1, D(y)(0) = 2, D(D(y))(0) = 3

$$CondIniEcua := y(0) = 1, D(y)(0) = 2, D^{(2)}(y)(0) = 3 \quad (12)$$

```

```
> Sol := dsolve({Ecua, CondIniEcua})

$$Sol := y(t) = -\frac{1}{2} e^t + 2 e^{2t} - \frac{1}{2} e^{3t} \quad (13)$$

```

```
> Sist := diff(yy[1](t), t) = yy[2](t), diff(yy[2](t), t) = yy[3](t), diff(yy[3](t), t) = 6·yy[1](t) - 11·yy[2](t) + 6·yy[3](t) :
```

> Sist[1]; Sist[2]; Sist[3]

$$\frac{d}{dt} yy_1(t) = yy_2(t)$$

$$\frac{d}{dt} yy_2(t) = yy_3(t)$$

$$\frac{d}{dt} yy_3(t) = 6 yy_1(t) - 11 yy_2(t) + 6 yy_3(t) \quad (14)$$

> Cond := yy[1](0) = 1, yy[2](0) = 2, yy[3](0) = 3

$$Cond := yy_1(0) = 1, yy_2(0) = 2, yy_3(0) = 3 \quad (15)$$

> SistSol := dsolve({Sist, Cond}) :

> SistSol[1]; SistSol[2]; SistSol[3];

$$yy_1(t) = -\frac{1}{2} e^t + 2 e^{2t} - \frac{1}{2} e^{3t}$$

$$yy_2(t) = 4 e^{2t} - \frac{3}{2} e^{3t} - \frac{1}{2} e^t$$

$$yy_3(t) = 8 e^{2t} - \frac{9}{2} e^{3t} - \frac{1}{2} e^t \quad (16)$$

>

> SolSistDos := simplify(subs(Param, SistSol)) : SolSistDos[1]

$$yy_1(t) = -\frac{1}{2} e^t + 2 e^{2t} - \frac{1}{2} e^{3t} \quad (17)$$

> Sol

$$y(t) = -\frac{1}{2} e^t + 2 e^{2t} - \frac{1}{2} e^{3t} \quad (18)$$

> restart

>

>

>

>

>