```
> restart
> Equation := 10·diff(i(t), t) + 2·i(t) = Heaviside(t − 3)·120·sin(120·Pi·t)
```

$$Equation := 10\left(\frac{d}{dt}\,i(t)\right) + 2\,i(t) = 120\,\text{Heaviside}(t-3)\,\sin(120\,\pi\,t) \tag{1}$$

```
> InitCond := i(0) = 0
```

$$InitCond := i(0) = 0 \tag{2}$$

```
> with(inttrans) :
> EquLapTrans := subs(InitCond, laplace(Equation, t, s))
```

$$EquLapTrans := 10\,s\,laplace(i(t), t, s) + 2\,laplace(i(t), t, s) = \frac{14400\,e^{-3s}\,\pi}{s^2 + 14400\,\pi^2} \tag{3}$$

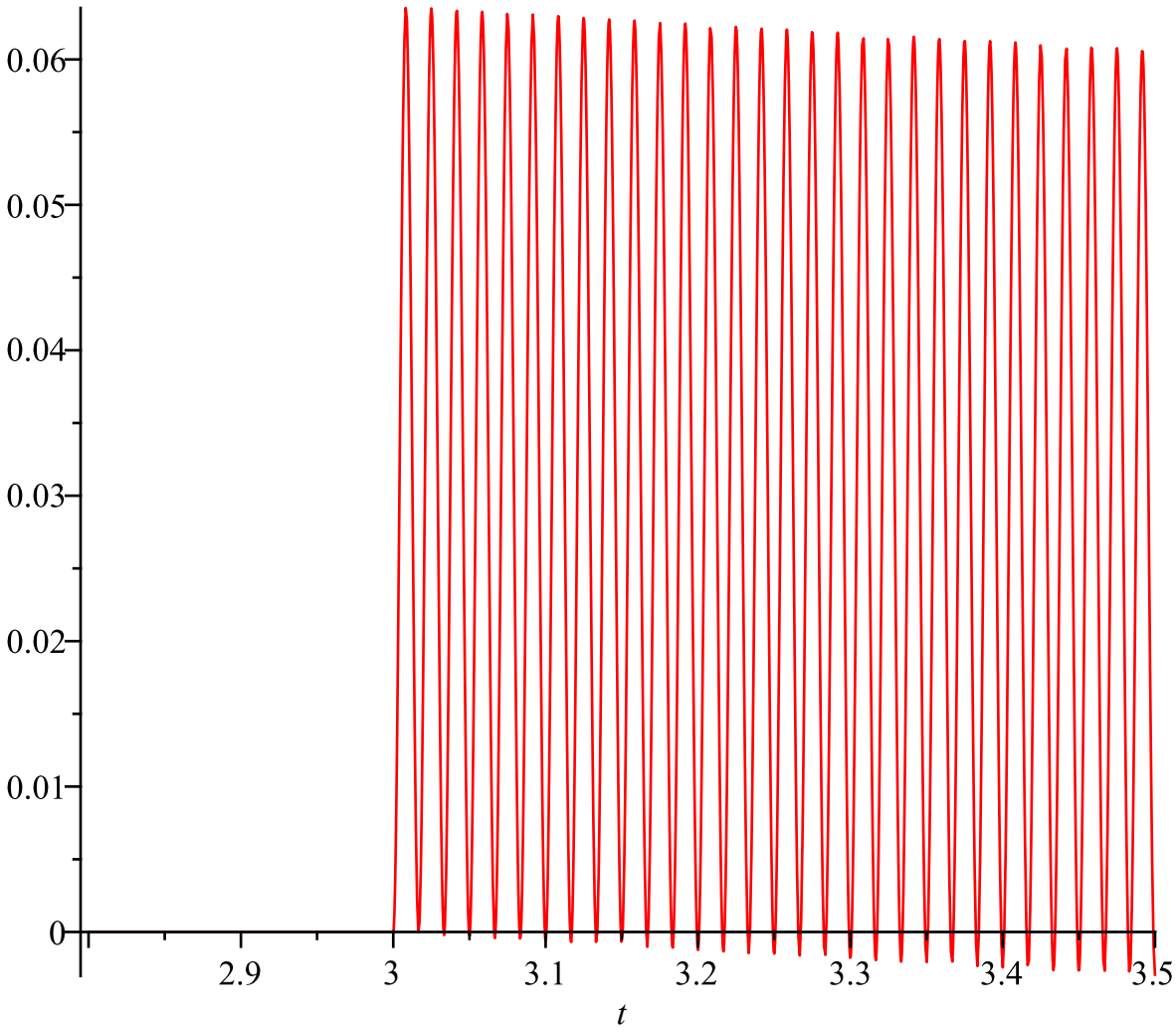
```
> PartSolLapTrans := isolate(EquLapTrans, laplace(i(t), t, s))
```

$$PartSolLapTrans := laplace(i(t), t, s) = \frac{14400\,e^{-3s}\,\pi}{\left(s^2 + 14400\,\pi^2\right)\,(10\,s + 2)} \tag{4}$$

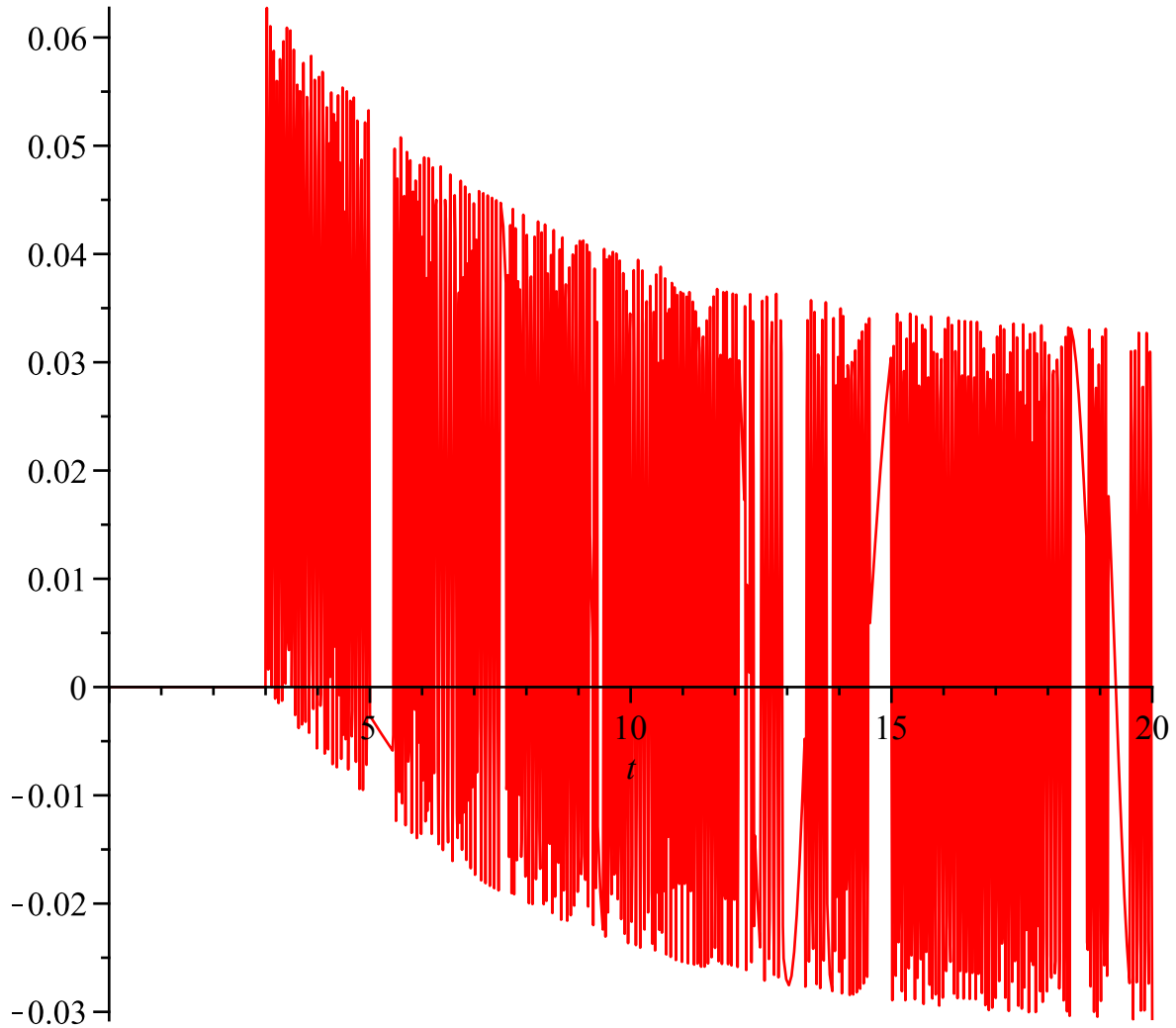
```
> PartSol := simplify(invlaplace(PartSolLapTrans, s, t))
```

$$PartSol := i(t) = -\frac{60\,\text{Heaviside}(t-3)\left(600\cos(120\,\pi\,t)\,\pi - \sin(120\,\pi\,t) - 600\,e^{-\frac{1}{5}t + \frac{3}{5}}\,\pi\right)}{1 + 360000\,\pi^2} \tag{5}$$

```
> plot(rhs(PartSol), t = 2.8 ..3.5)
```




```
> plot(rhs(PartSol), t = 0 ..20)
```




```
> restart
>
```

$$\left[u(t-2)e^{-(t-2)}\sin(t-2)\right] * \left[e^{-t}\cos(t) - e^{-t}\sin(t)\right]$$

```
> f := Heaviside(t - 2)·exp(-(t - 2))·sin(t - 2)
```

$$f := \text{Heaviside}(t-2)\, e^{-t+2} \sin(t-2) \quad \textbf{(6)}$$

```
> g := exp(-t)·cos(t) - exp(-t)·sin(t)
```

$$g := e^{-t}\cos(t) - e^{-t}\sin(t) \quad \textbf{(7)}$$

```
> ff := subs(t = tau, f)
```

$$ff := \text{Heaviside}(\tau - 2)\, e^{-\tau+2} \sin(\tau - 2) \quad \textbf{(8)}$$

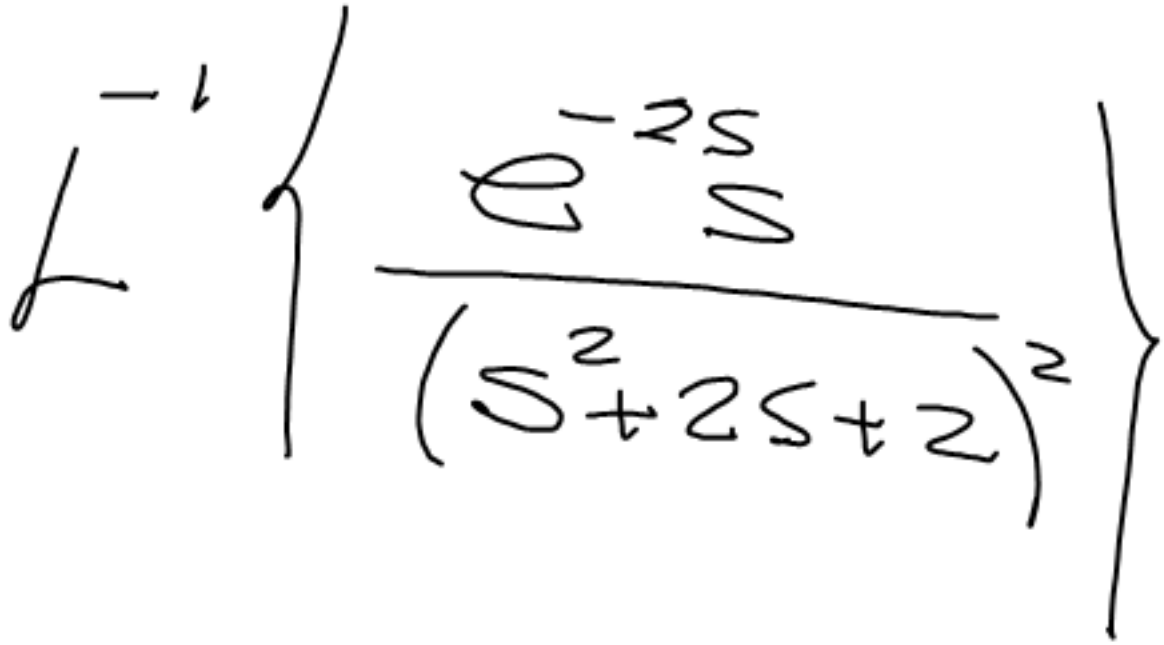
```
> gg := subs(t = t - tau, g)
```

$$gg := e^{-t+\tau}\cos(t-\tau) - e^{-t+\tau}\sin(t-\tau) \quad \textbf{(9)}$$

```
> Sol := simplify(int(ff·gg, tau = 0 ..t))
```

$$Sol := \frac{1}{2}\,\text{Heaviside}(t-2)\,e^{-t+2}\,(-2\cos(2)\cos(t)+\cos(2)\sin(t)\,t-\sin(2)\cos(t)\,t \tag{10}$$
$$-3\cos(2)\sin(t)+3\sin(2)\cos(t)+\cos(2)\cos(t)\,t+\sin(2)\sin(t)\,t-2\sin(2)\sin(t))$$

```
>
```



```
> with(inttrans)
```

$$[addtable, fourier, fouriercos, fouriersin, hankel, hilbert, invfourier, invhilbert, invlaplace, \tag{11}$$
$$invmellin, laplace, mellin, savetable]$$

```
> H := exp(-2 s)·s/(s··2+2·s+2)··2
```

$$H := \frac{e^{-2s}\,s}{(s^2+2s+2)^2} \tag{12}$$

```
> SOL := invlaplace(H, s, t)
```

$$SOL := \frac{1}{2}\,\text{Heaviside}(t-2)\,e^{-t+2}\,(\cos(t-2)\,(t-2)+\sin(t-2)\,(-3+t)) \tag{13}$$

```
> Sol;
```

$$\frac{1}{2}\,\text{Heaviside}(t-2)\,e^{-t+2}\,(-2\cos(2)\cos(t)+\cos(2)\sin(t)\,t-\sin(2)\cos(t)\,t \tag{14}$$
$$-3\cos(2)\sin(t)+3\sin(2)\cos(t)+\cos(2)\cos(t)\,t+\sin(2)\sin(t)\,t-2\sin(2)\sin(t))$$

```
> simplify(SOL - Sol)
```

$$0 \tag{15}$$

```
> restart
>
```

$$\frac{d^3y(t)}{dt^3} - 4\frac{d^2y(t)}{dt^2} - 6y(t) = t^2 e^{3t}\cos(4t)$$

$$y(0)=2 \quad y'(0)=-6 \quad y''(0)=8$$

```
> Equa := diff(y(t), t$3) - 4·diff(y(t), t$2) - 6·y(t) = t··2·exp(3 t)·cos(4·t)
```

$$Equa := \frac{d^3}{dt^3}y(t) - 4\left(\frac{d^2}{dt^2}y(t)\right) - 6\,y(t) = t^2\,e^{3t}\cos(4\,t) \tag{16}$$

```
> InitCond := y(0) = 2, D(y)(0) = -6, D(D(y))(0) = 8
```

$$InitCond := y(0) = 2,\ D(y)(0) = -6,\ D^{(2)}(y)(0) = 8 \tag{17}$$

```
> with(inttrans) :
> EquaLapTrans := subs(InitCond, laplace(Equa, t, s))
```

$$EquaLapTrans := s^3\,laplace(y(t),t,s) - 32 + 14\,s - 2\,s^2 - 4\,s^2\,laplace(y(t),t,s) - 6\,laplace(y(t),t,s) = \frac{1}{(s-3-4\,I)^3} + \frac{1}{(s-3+4\,I)^3} \tag{18}$$

```
> PartSolLapTrans := simplify(isolate(EquaLapTrans, laplace(y(t), t, s)))
```

$$PartSolLapTrans := laplace(y(t),t,s) = -\frac{1}{(-s+3+4\,I)^3\,(s-3+4\,I)^3\,(s^3-4\,s^2-6)}\,(2\,(250117 - 289396\,s - 61130\,s^3 + 167566\,s^2 - 2685\,s^5 + 15315\,s^4 - 25\,s^7 + 325\,s^6 + s^8)) \tag{19}$$

```
> PartSol := invlaplace(PartSolLapTrans, s, t)
```

$$PartSol := y(t) = -\frac{1}{1011697087377603}\sum_{\_\alpha = RootOf(\_Z^3 - 4\,\_Z^2 - 6)}(601998895774712\,\_\alpha^2 - 414996539147958 - 2601730175966891\,\_\alpha)\,e^{-\alpha t} - \frac{1}{1613551973489}\,(5\cos(4\,t)\,(2613819379\,t^2 - 1105641416 + 519618158\,t) + 4\sin(4\,t)\,(-4090136880\,t + 1788402733\,t^2 + 270294796))\,e^{3t} \tag{20}$$

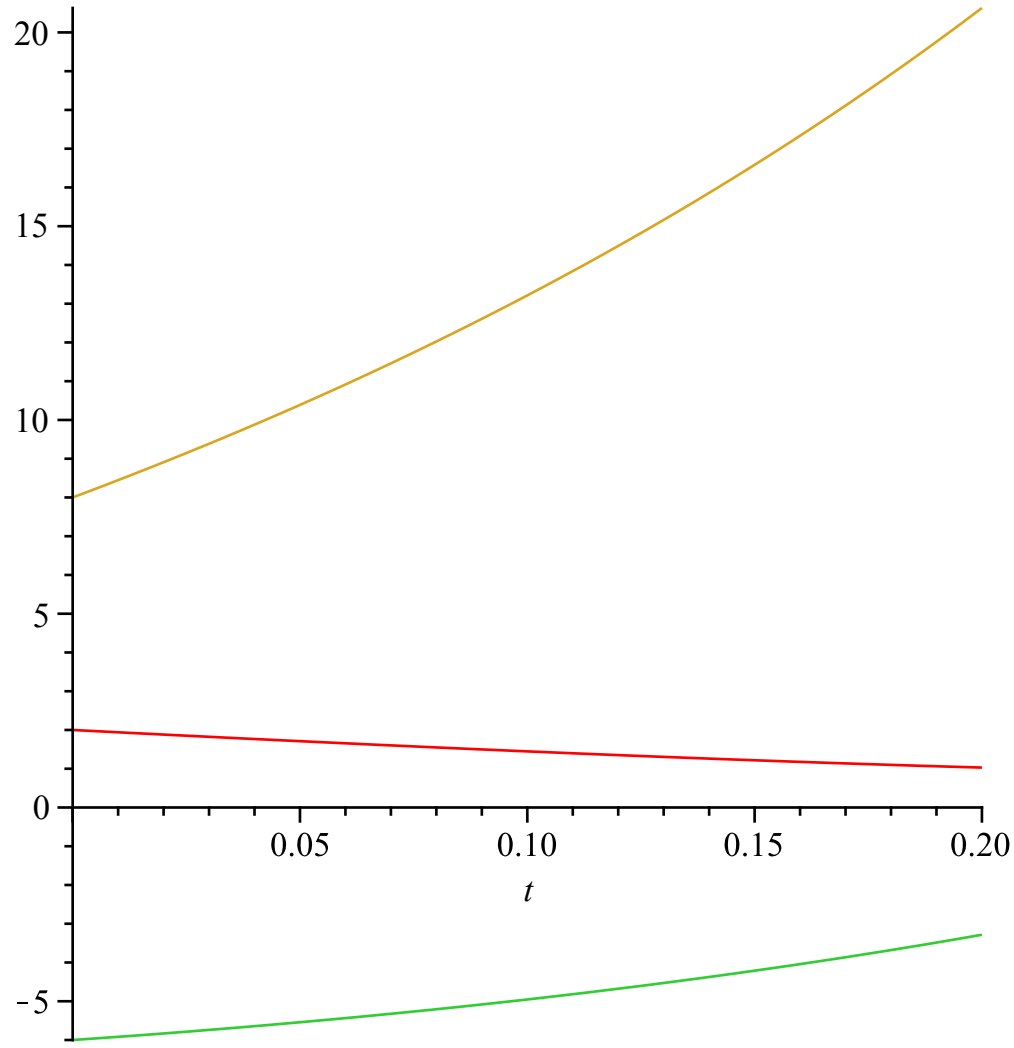
```
> CaracEquat := m··3 - 4·m··2 - 6 = 0
```

$$CaracEquat := m^3 - 4\,m^2 - 6 = 0 \tag{21}$$

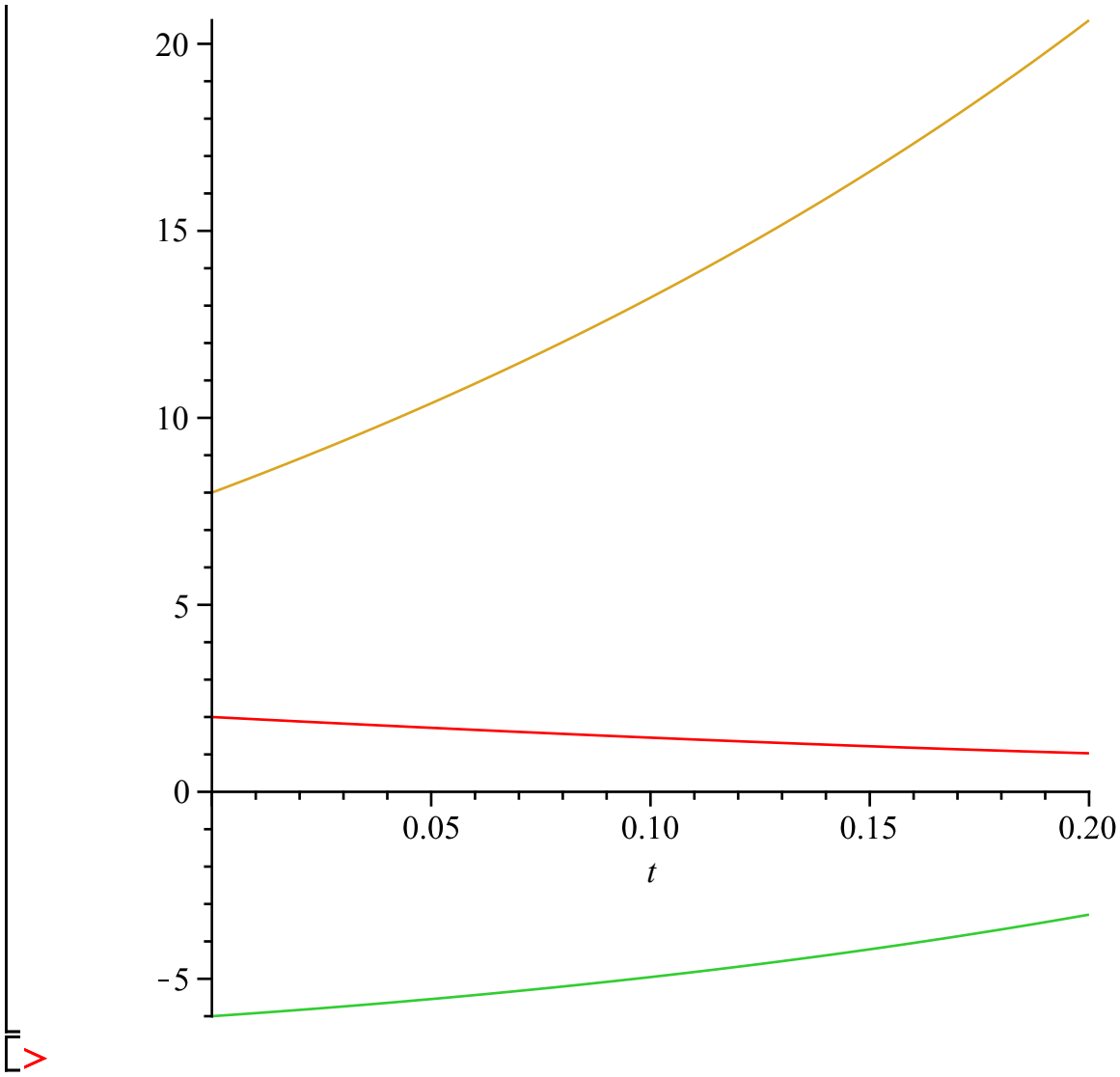
```
> Root := solve(CaracEquat) : evalf(%)
```

$$4.321307527,\ -0.160653765 + 1.167329864\,I,\ -0.160653765 - 1.167329864\,I \tag{22}$$

```
> PPartSSol := dsolve({Equa, InitCond}) :
> plot([rhs(PPartSSol), rhs(diff(PPartSSol, t)), rhs(diff(PPartSSol, t$2))], t = 0..0.2)
```




```
> plot([rhs(PartSol), rhs(diff(PartSol, t)), rhs(diff(PartSol, t$2))], t = 0..0.2)
```


20
15
10
5
0
-5
0.05
0.10
0.15
0.20
t