```
> restart
```

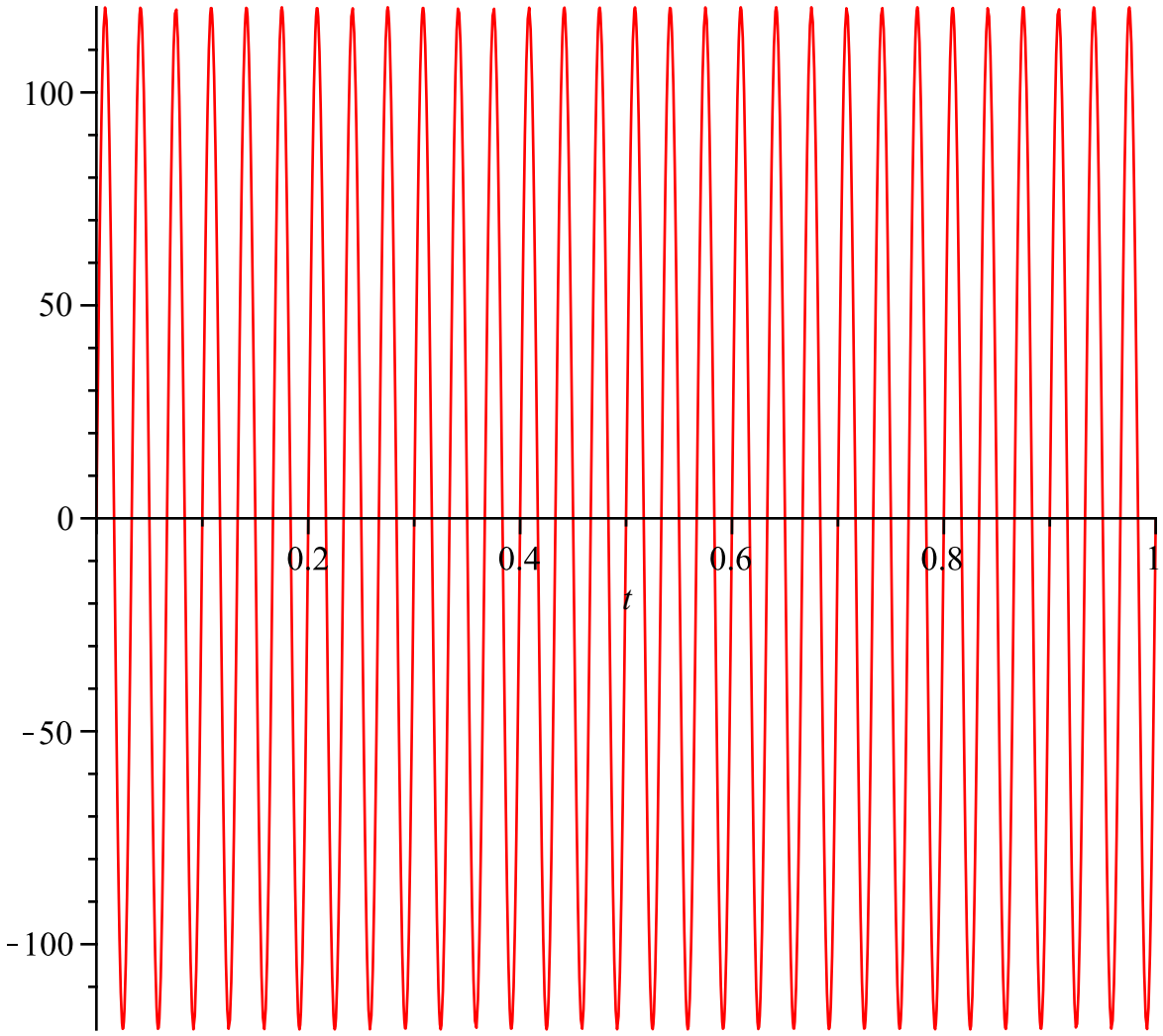
Circuito L-R-C

```
> Ecuacion := R·diff(q(t), t) + L·diff(q(t), t$2) + q(t)/C = EE
```

$$Ecuacion := R\left(\frac{d}{dt}q(t)\right) + L\left(\frac{d^2}{dt^2}q(t)\right) + \frac{q(t)}{C} = EE \tag{1}$$

```
> EE := 120·sin(60·Pi·t); plot(EE, t = 0..1)
```

$$EE := 120\sin(60\,\pi\,t)$$




```
> R := 10; C := 10··(-3); L := 3
```

$$R := 10$$

$$C := \frac{1}{1000}$$

$$L := 3 \tag{2}$$

```
> Ecuacion;
```

$$10\left(\frac{d}{dt}q(t)\right) + 3\left(\frac{d^2}{dt^2}q(t)\right) + 1000\,q(t) = 120\sin(60\,\pi\,t) \tag{3}$$

```
> Condiciones := q(0) = 0, D(q)(0) = 0
```

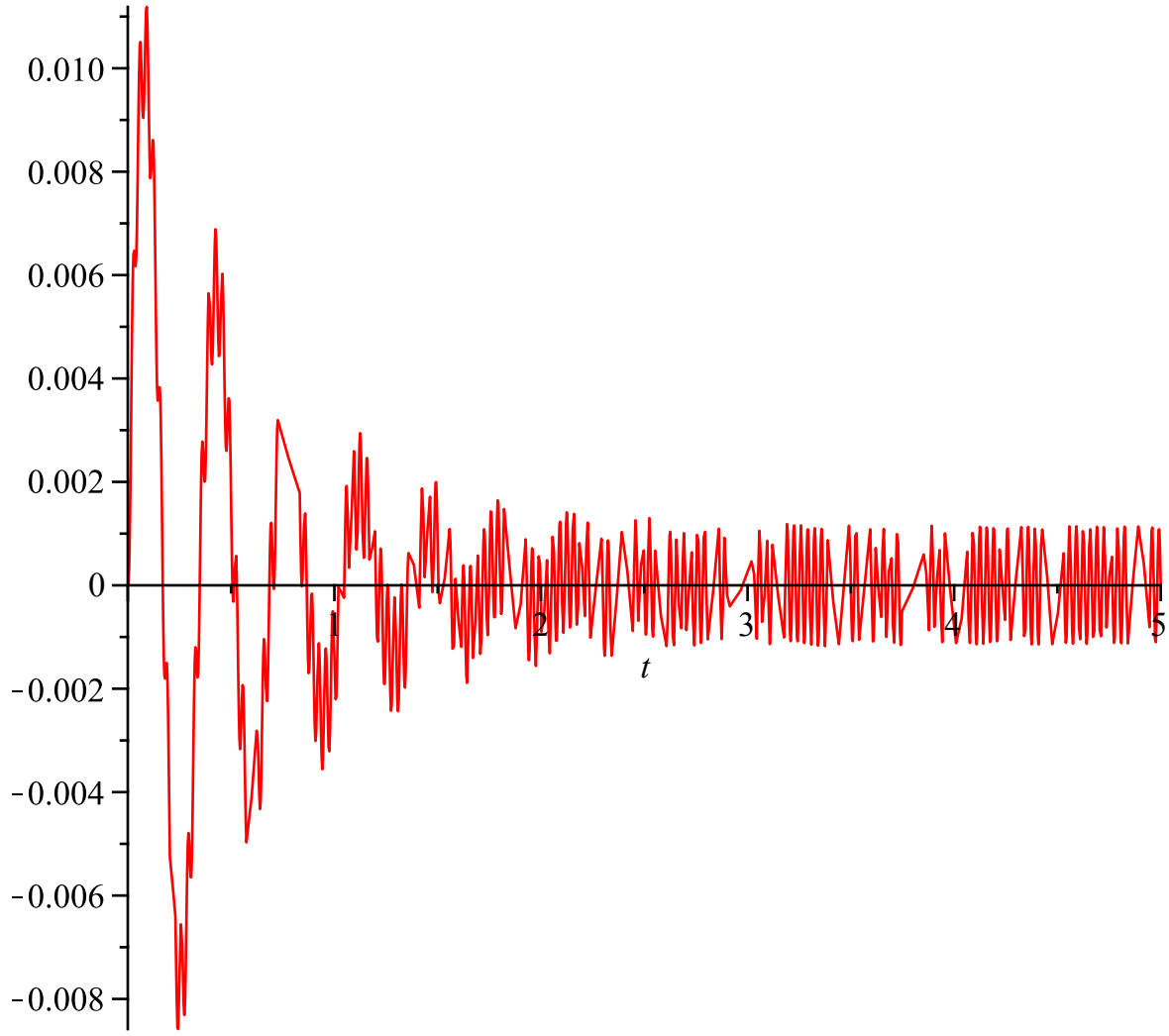
(4)

$$Condiciones := q(0) = 0,\ D(q)(0) = 0 \quad \textbf{(4)}$$

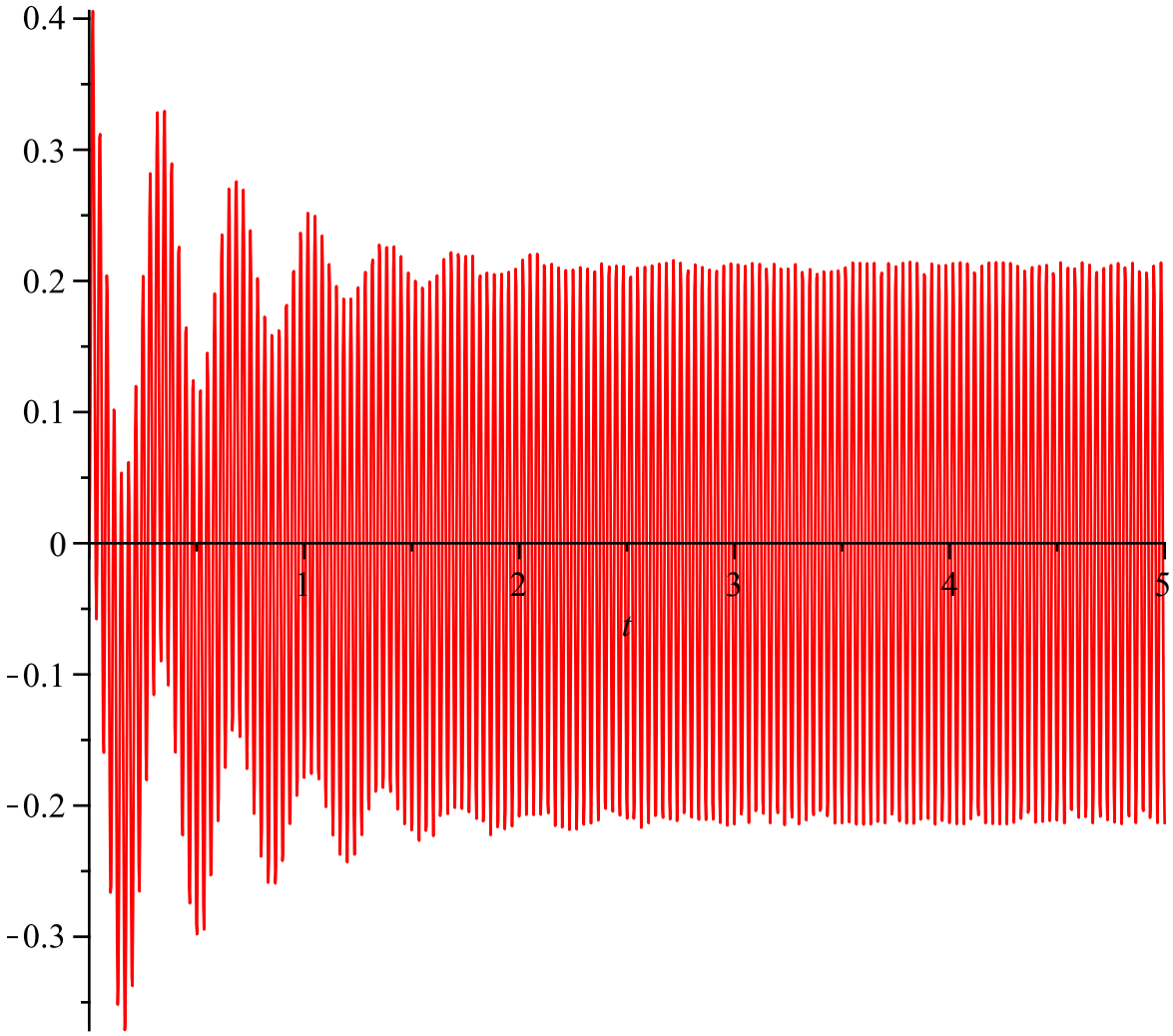
```
> SolucionParticular := dsolve({Ecuacion, Condiciones}) : evalf(%, 2)
```

$$q(t) = 0.012\, e^{-1.7\,t} \sin(19.\,t) + 0.000022\, e^{-1.7\,t} \cos(19.\,t) - 0.0011 \sin(190.\,t) - 0.000020 \cos(190.\,t) \quad \textbf{(5)}$$

```
> plot(rhs(SolucionParticular), t = 0..5)
```




```
> plot(rhs(diff(SolucionParticular, t)), t = 0..5)
```



> *restart*

Masa, Amortiguador, Resorte

> $Ecuacion := Masa \cdot diff(y(t), t\$2) = -R \cdot y(t) - DD \cdot diff(y(t), t)$

$$Ecuacion := Masa\left(\frac{d^2}{dt^2} y(t)\right) = -R\, y(t) - DD\left(\frac{d}{dt} y(t)\right) \quad (6)$$

> $Masa := \frac{1500}{\left(\frac{962}{100}\right)}; R := 10; DD := 10;$

$$Masa := \frac{75000}{481}$$
$$R := 10$$
$$DD := 10 \quad (7)$$

> $Condiciones := y(0) = \frac{1}{10}, D(y)(0) = 0;$

$$Condiciones := y(0) = \frac{1}{10}, D(y)(0) = 0 \quad (8)$$

> *Ecuacion*

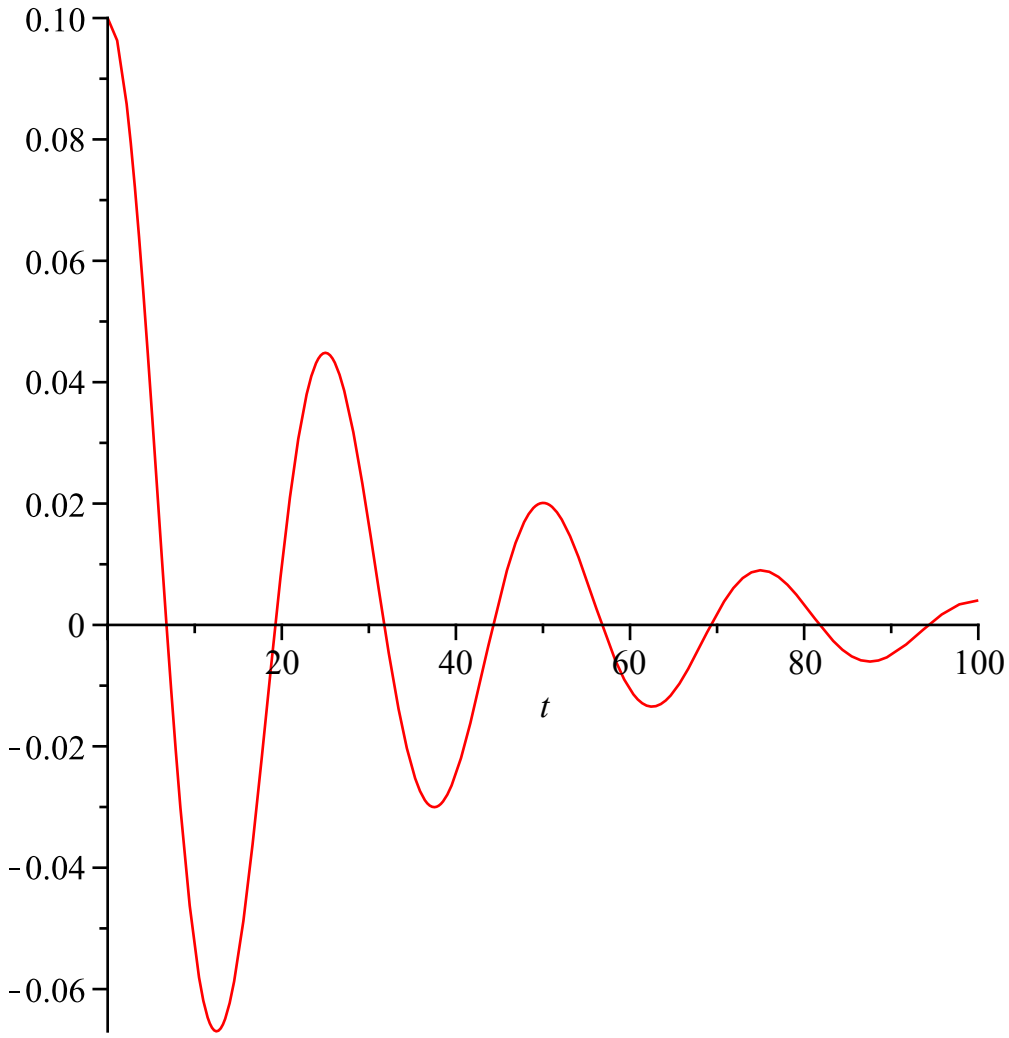
(9)

$$\frac{75000}{481}\,\frac{d^2}{dt^2}y(t) = -10\,y(t) - 10\left(\frac{d}{dt}y(t)\right) \quad (9)$$

> *SolucionParticular* := *dsolve*({*Ecuacion*, *Condiciones*}) : *evalf*(%, 2)

$$y(t) = 0.013\,e^{-0.032\,t}\sin(0.25\,t) + 0.10\,e^{-0.032\,t}\cos(0.25\,t) \quad (10)$$

> *plot*(*rhs*(*SolucionParticular*), *t* = 0..100)



> *restart*

RESONANCIA

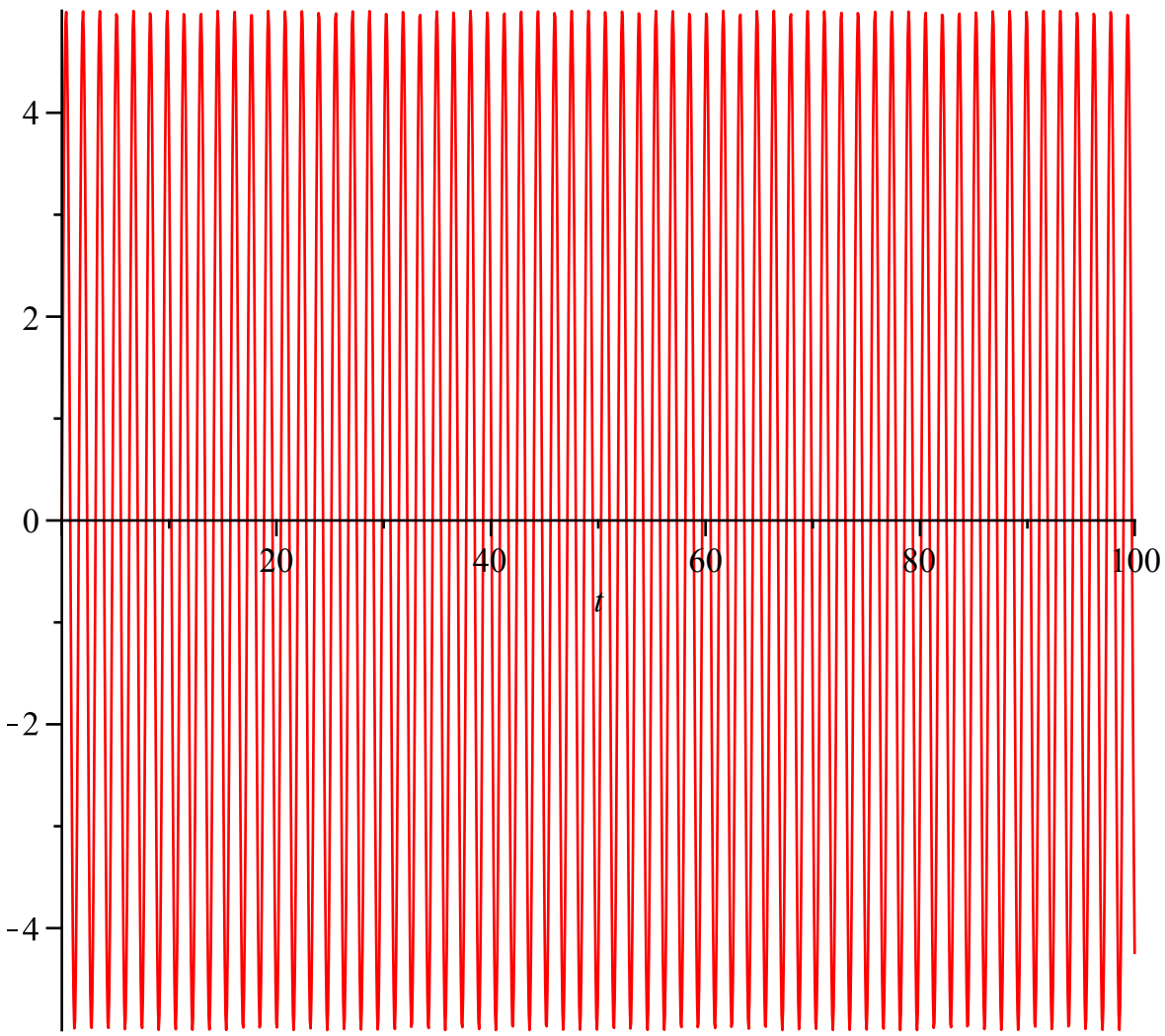
> *Ecuacion* := *diff*(*x*(*t*), *t*$2) + 16·*x*(*t*) = *EE*

$$Ecuacion := \frac{d^2}{dt^2}x(t) + 16\,x(t) = EE \quad (11)$$

> *EE* := 5·sin(4 *t*)

$$EE := 5\sin(4\,t) \quad (12)$$

> *plot*(*EE*, *t* = 0..100)



> $Condiciones := x(0) = 0, D(x)(0) = 0$

$$Condiciones := x(0) = 0, D(x)(0) = 0 \quad (13)$$

> $EcuacionHom := lhs(Ecuacion) = 0$

$$EcuacionHom := \frac{d^2}{dt^2} x(t) + 16\, x(t) = 0 \quad (14)$$

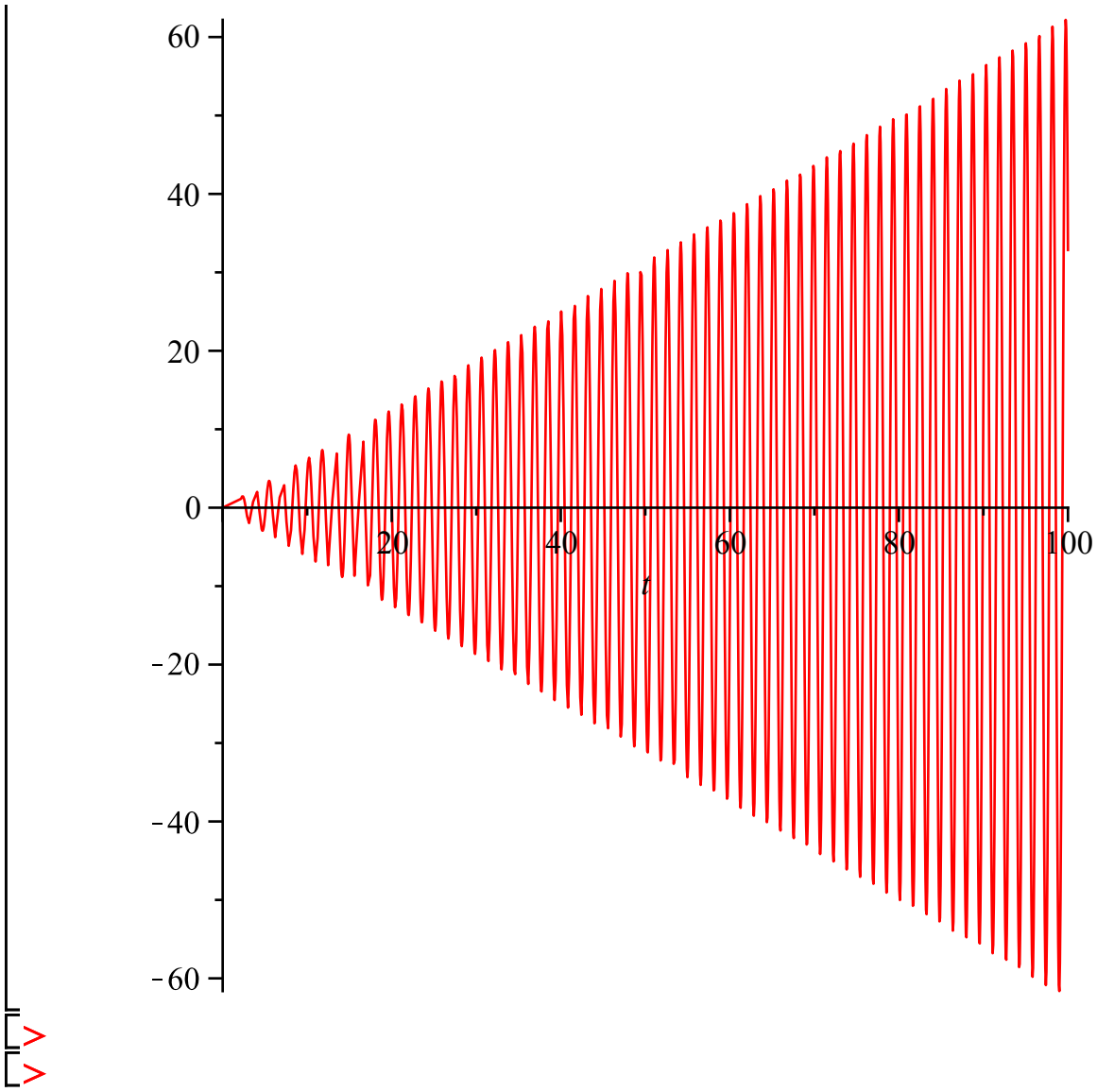
> $SolucionGeneral := dsolve(EcuacionHom)$

$$SolucionGeneral := x(t) = _C1 \sin(4\, t) + _C2 \cos(4\, t) \quad (15)$$

> $SolucionParticular := dsolve(\{Ecuacion, Condiciones\})$

$$SolucionParticular := x(t) = \frac{5}{32} \sin(4\, t) - \frac{5}{8} \cos(4\, t)\, t \quad (16)$$

> $plot(rhs(SolucionParticular), t = 0..100)$


60
40
20
0
-20
-40
-60
20
40
60
80
100
t