> #--Ex1:
> eq1 := diff(x(t), t$4) − x(t) = 0;

$$eq1 := \frac{d^4}{dt^4} x(t) − x(t) = 0 \tag{1}$$

> dsolve(eq1, x(t));

$$x(t) = c_1 e^t + c_2 e^{−t} + c_3 \sin(t) + c_4 \cos(t) \tag{2}$$

> x := t→sin(t);

$$x := t \mapsto \sin(t) \tag{3}$$

> x(t);

$$\sin(t) \tag{4}$$

> eq1;

$$0 = 0 \tag{5}$$

> #cum a dat 0 inseamna ca i o solutie
>
> x := t→sinh(t);

$$x := t \mapsto \sinh(t) \tag{6}$$

> eq1;

$$0 = 0 \tag{7}$$

> x := t→cosh(t);

$$x := t \mapsto \cosh(t) \tag{8}$$

> eq1;

$$0 = 0 \tag{9}$$

>
>
> − − − − − − − − − − − − − − − −#Ex2:
> de ex ce face restart :
> restart;
> a := 2;

$$a := 2 \tag{10}$$

> a

$$2 \tag{11}$$

> restart;
> a

$$a \tag{12}$$

> #2-----
> eq2 := diff(x(t), t) + t·x(t) = 0;

$$eq2 := \frac{d}{dt} x(t) + t x(t) = 0 \tag{13}$$

> init := x(0) = 10;

$$init := x(0) = 10 \tag{14}$$

> $dsolve(\{eq2\}, x(t))$;

$$\left\{ x(t) = c_1 \, e^{-\frac{t2}{2}} \right\} \tag{15}$$

> $sol2 := dsolve(\{eq2, init\}, x(t))$;
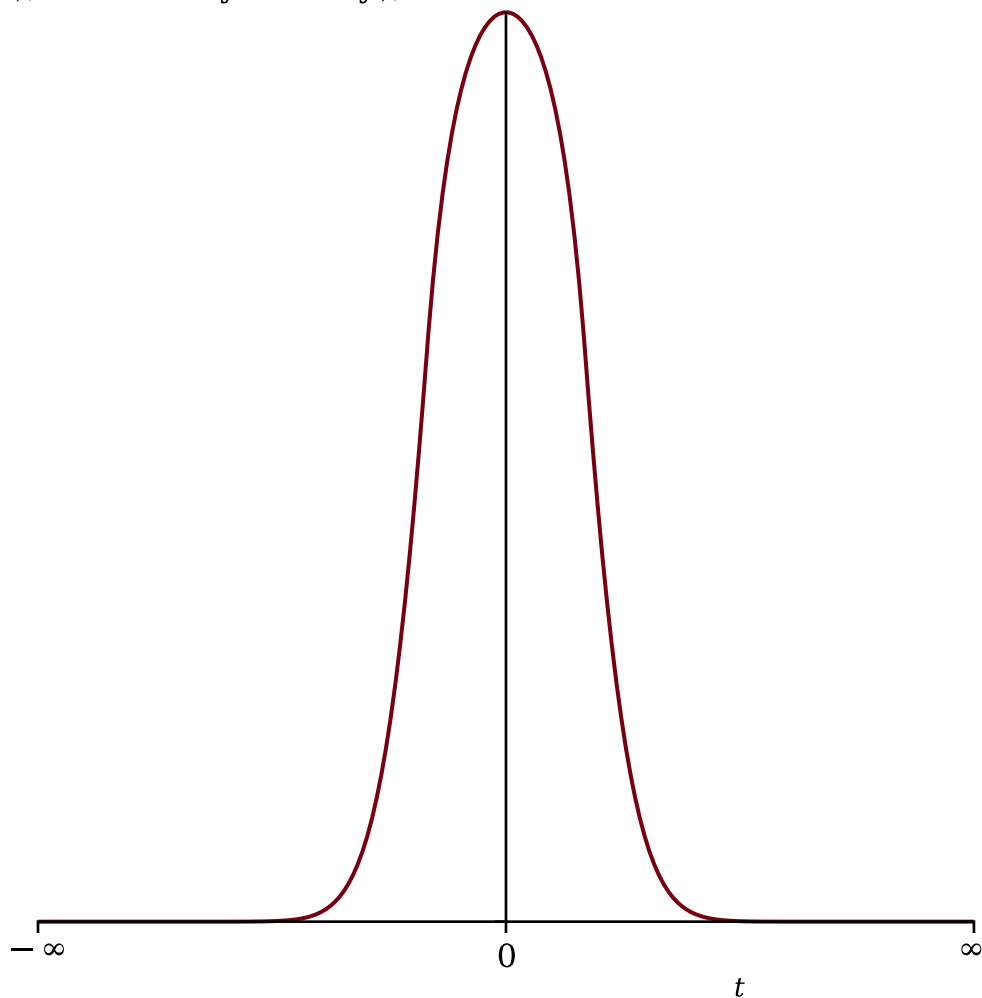
$$sol2 := x(t) = 10 \, e^{-\frac{t2}{2}} \tag{16}$$

> $f4 := unapply(rhs(sol2), t)$;

$$f4 := t \mapsto 10 \cdot e^{-\frac{t2}{2}} \tag{17}$$

>

> $f4(t)$;

$$f4(t) \tag{18}$$

> $plot(f4(t), t = -\text{infinity} .. \text{infinity})$;

>

>

> #4

> $eq4 := 4 \cdot diff(x(t), t\$2) + 8 \cdot diff(x(t), t) + 5 \cdot x(t) = 0$;

$$eq4 := 4 \, \frac{d^2}{dt^2} \, x(t) + 8 \, \frac{d}{dt} \, x(t) + 5 \, x(t) = 0 \tag{19}$$

> $cond := x(0) = 2, \mathrm{D}(x)(0) = 3;$
$$cond := x(0) = 2, \mathrm{D}(x)(0) = 3 \tag{20}$$

> $sol4 := dsolve(\{eq4, cond\}, x(t));$
$$sol4 := x(t) = 2\,\mathrm{e}^{-t}\left(5\sin\left(\frac{t}{2}\right) + \cos\left(\frac{t}{2}\right)\right) \tag{21}$$
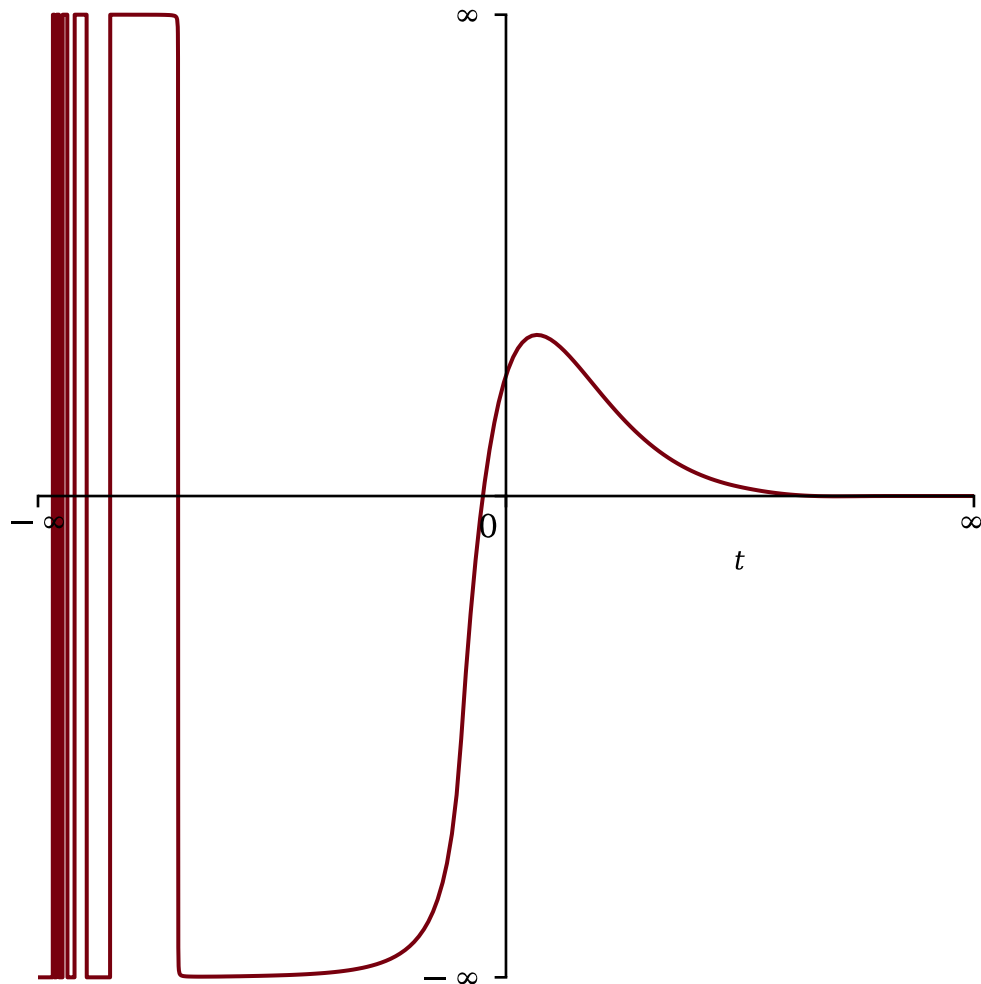
> $xx := unapply(rhs(sol4), t);$
$$xx := t \mapsto 2\cdot\mathrm{e}^{-t}\cdot\left(5\cdot\sin\left(\frac{t}{2}\right) + \cos\left(\frac{t}{2}\right)\right) \tag{22}$$

> $xx(t); limit(xx(t), t = \text{infinity});$
$$2\,\mathrm{e}^{-t}\left(5\sin\left(\frac{t}{2}\right) + \cos\left(\frac{t}{2}\right)\right)$$
$$0 \tag{23}$$

> $plot(xx(t), t = -\text{infinity}\,..\text{infinity});$

> $dsolve(eq4, x(t));$
$$x(t) = c_1\,\mathrm{e}^{-t}\sin\left(\frac{t}{2}\right) + c_2\,\mathrm{e}^{-t}\cos\left(\frac{t}{2}\right) \tag{24}$$

> #3
> $eq3 := diff(x(t), t\$2) + diff(x(t), t) = 0;$

$$eq3 := \frac{\mathrm{d}^2}{\mathrm{d}t^2}\, x(t) + \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) = 0 \tag{25}$$

> `dsolve(eq3, x(t));`

$$x(t) = c_1 + c_2\, \mathrm{e}^{-t} \tag{26}$$

> `#1`
> `eq5 :=`

$$eq5 := .$$

>
> `#----------------------------------------------------------------------------EX6`
> `eq := diff(x(t), t$2) + x(t) = 0;`

$$eq := \frac{\mathrm{d}^2}{\mathrm{d}t^2}\, x(t) + x(t) = 0 \tag{27}$$

> `cardin := x\left(\frac{Pi}{2}\right) = 1, D(x)\left(\frac{Pi}{2}\right) = -2;`

$$cardin := x\left(\frac{\pi}{2}\right) = 1,\, \mathrm{D}(x)\left(\frac{\pi}{2}\right) = -2 \tag{28}$$

> `sol := dsolve({eq, cardin}, x(t));`

$$sol := x(t) = \sin(t) + 2\cos(t) \tag{29}$$

> `expand(sol);`

$$x(t) = \sin(t) + 2\cos(t) \tag{30}$$

> `expand\left(sqrt(5)\cdot\cos\left(t - \arctan\left(\frac{1}{2}\right)\right)\right);`
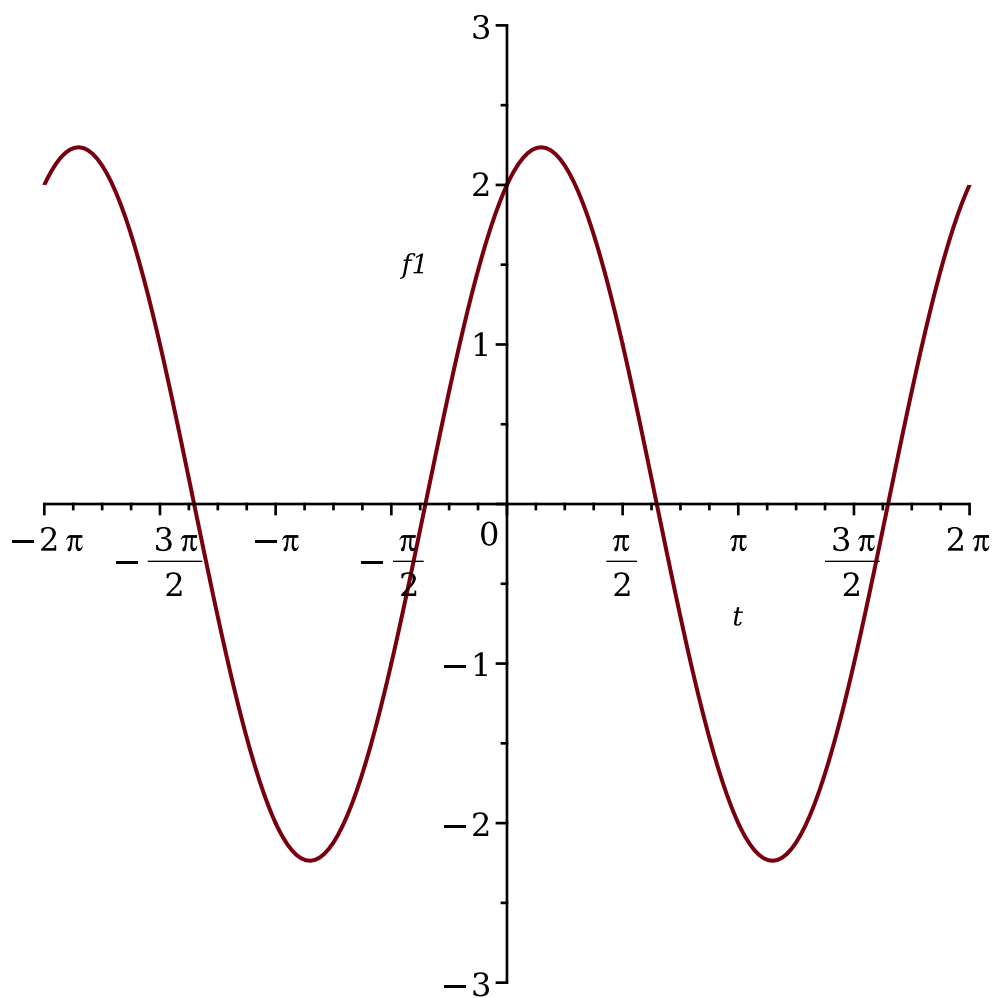
$$\sin(t) + 2\cos(t) \tag{31}$$

>
> `f1 := unapply(rhs(sol), t);`

$$f1 := t \mapsto \sin(t) + 2\cdot\cos(t) \tag{32}$$

> `f1(t); limit(f1(t), t = infinity)`

$$\sin(t) + 2\cos(t)$$
$$-3 .. 3 \tag{33}$$

> `plot(f1(t), t = -2\cdot Pi .. 2\cdot Pi, f1 = -3 .. 3)`

>

> #Ex7:and #Ex8 la fel ca 6

>

>

> #Ex9:

> restart;

> ec1 := diff(x(t), t$2) + a(t)·x(t) = 0;

$$ec1 := \frac{d^2}{dt^2}\, x(t) + 5\, x(t) = 0 \qquad\qquad \textbf{(34)}$$

> a(t) := 5;

$$a := t \mapsto 5 \qquad\qquad \textbf{(35)}$$

> ec1;

$$\frac{d^2}{dt^2}\, x(t) + 5\, x(t) = 0 \qquad\qquad \textbf{(36)}$$

> infolevel[dsolve] := 3;

$$infolevel_{dsolve} := 3 \qquad\qquad \textbf{(37)}$$

> dsolve(ec1, x(t));

Methods for second order ODEs:
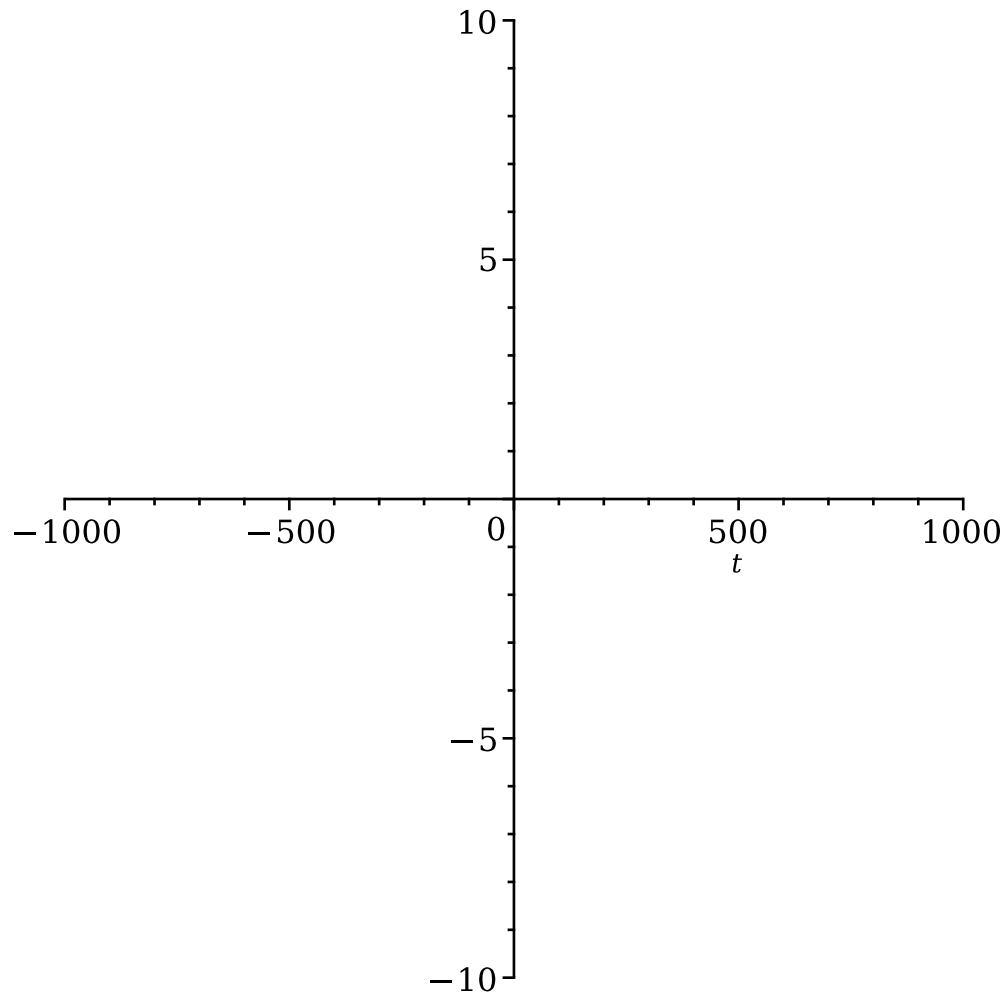
$$x(t) = c_1 \sin(\sqrt{5}\, t) + c_2 \cos(\sqrt{5}\, t) \tag{38}$$

> #indolevel ne ajuta sa vedem in cati pasi aflam raspunsul

>

> $plot(BasselJ(1, t), t = -1000 .. 1000);$

Warning, expecting only range variable t in expression BasselJ(1,t) to be plotted but found name BasselJ

>

> #--

> #Ex10:

> restart;

> $de := diff(x(t), t\$2) + x(t) = 0;$

$$de := \frac{d^2}{dt^2}\, x(t) + x(t) = 0 \tag{39}$$

> $bc := x(0) = 0, x(\mathrm{Pi}) = 0;$

$$bc := x(0) = 0, x(\pi) = 0 \tag{40}$$

> $dsolve(\{de, bc\}, x(t));$

$$x(t) = c_1 \sin(t) \tag{41}$$

> #EX11:
> restart;
> $de := diff(x(t), t\$2) + x(t) = 0;$

$$de := \frac{d^2}{dt^2} x(t) + x(t) = 0 \tag{42}$$

> $bc := x(0) = 0, x(1) = 0;$

$$bc := x(0) = 0, x(1) = 0 \tag{43}$$

> $dsolve(\{de, bc\}, x(t));$

$$x(t) = 0 \tag{44}$$

>

> #EX12:
> restart;
> $de := diff(x(t), t\$2) + x(t) = 1;$

$$de := \frac{d^2}{dt^2} x(t) + x(t) = 1 \tag{45}$$

> $bc := x(t) = 0, x(\text{Pi}) = 0;$

$$bc := x(t) = 0, x(\pi) = 0 \tag{46}$$

> $dsolve(\{de, bc\}, x(t));$
>

> #EX13:
> restart;
> $eq1 := diff(x(t), t) + x(t) = 15;$

$$eq1 := \frac{d}{dt} x(t) + x(t) = 15 \tag{47}$$

> $dsolve(eq1, x(t));$

$$x(t) = 15 + e^{-t} c_1 \tag{48}$$

>

> #EX14:
> restart;
> $eq2 := diff(x(t), t) + x(t) = 2 \cdot \exp(t) - 7 \cdot \exp(-3 t);$

$$eq2 := \frac{d}{dt} x(t) + x(t) = 2 e^t - 7 e^{-3 t} \tag{49}$$

> $dsolve(eq2, x(t));$

$$x(t) = \frac{7 e^{-3 t}}{2} + e^t + e^{-t} c_1 \tag{50}$$

> #EX15:
> $eq3 := diff(x(t), t) + x(t) = -t^2 + 3 t - 7;$

$$eq3 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) + x(t) = -t^2 + 3\, t - 7 \tag{51}$$

```
> dsolve(eq3, x(t));
```
$$x(t) = -t^2 + 5\, t - 12 + \mathrm{e}^{-t}\, c_1 \tag{52}$$

```
> #Ex16:
> restart;
> eq4 := diff(x(t), t) + x(t) = sin(t) + 3·cos(t);
```
$$eq4 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) + x(t) = \sin(t) + 3\cos(t) \tag{53}$$

```
> dsolve(eq4, x(t));
```
$$x(t) = \cos(t) + 2\sin(t) + \mathrm{e}^{-t}\, c_1 \tag{54}$$

```
> #EX17:
> restart;
> eq5 := diff(x(t), t) + x(t) = sin(t);
```
$$eq5 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) + x(t) = \sin(t) \tag{55}$$

```
> dsolve(eq5, x(t));
```
$$x(t) = -\frac{\cos(t)}{2} + \frac{\sin(t)}{2} + \mathrm{e}^{-t}\, c_1 \tag{56}$$

```
> #EX18:
> restart;
> eq6 := diff(x(t), t) + x(t) = 3·cos(t);
```
$$eq6 := \frac{\mathrm{d}}{\mathrm{d}t}\, x(t) + x(t) = 3\cos(t) \tag{57}$$

```
> dsolve(eq6, x(t));
```
$$x(t) = \frac{3\cos(t)}{2} + \frac{3\sin(t)}{2} + \mathrm{e}^{-t}\, c_1 \tag{58}$$

```
>
```