```
> restart :
>
```

$$\frac{d^2y}{dt^2} - 7\frac{dy}{dt} + 12y = 2e^{2t} \qquad y(0) = 2 \qquad y'(0) = -4$$

```
> Equation := diff(y(t), t$2) - 7·diff(y(t), t) + 12·y(t) = 2·exp(2·t);
```

$$Equation := \frac{d^2}{dt^2} y(t) - 7\left(\frac{d}{dt} y(t)\right) + 12\, y(t) = 2\, e^{2t} \tag{1}$$

```
> InitialCondition := y(0) = 2, D(y)(0) = -4;
```

$$InitialCondition := y(0) = 2,\ D(y)(0) = -4 \tag{2}$$

```
> with(inttrans) :
> LapTransEquation := subs(InitialCondition, laplace(Equation, t, s));
```

$$LapTransEquation := s^2\, laplace(y(t), t, s) + 18 - 2s - 7s\, laplace(y(t), t, s) + 12\, laplace(y(t), t, s) = \frac{2}{s-2} \tag{3}$$

```
> LapTransSolution := simplify(isolate(LapTransEquation, laplace(y(t), t, s)));
```

$$LapTransSolution := laplace(y(t), t, s) = \frac{2\,(19 - 11s + s^2)}{(s-2)\,(s^2 - 7s + 12)} \tag{4}$$

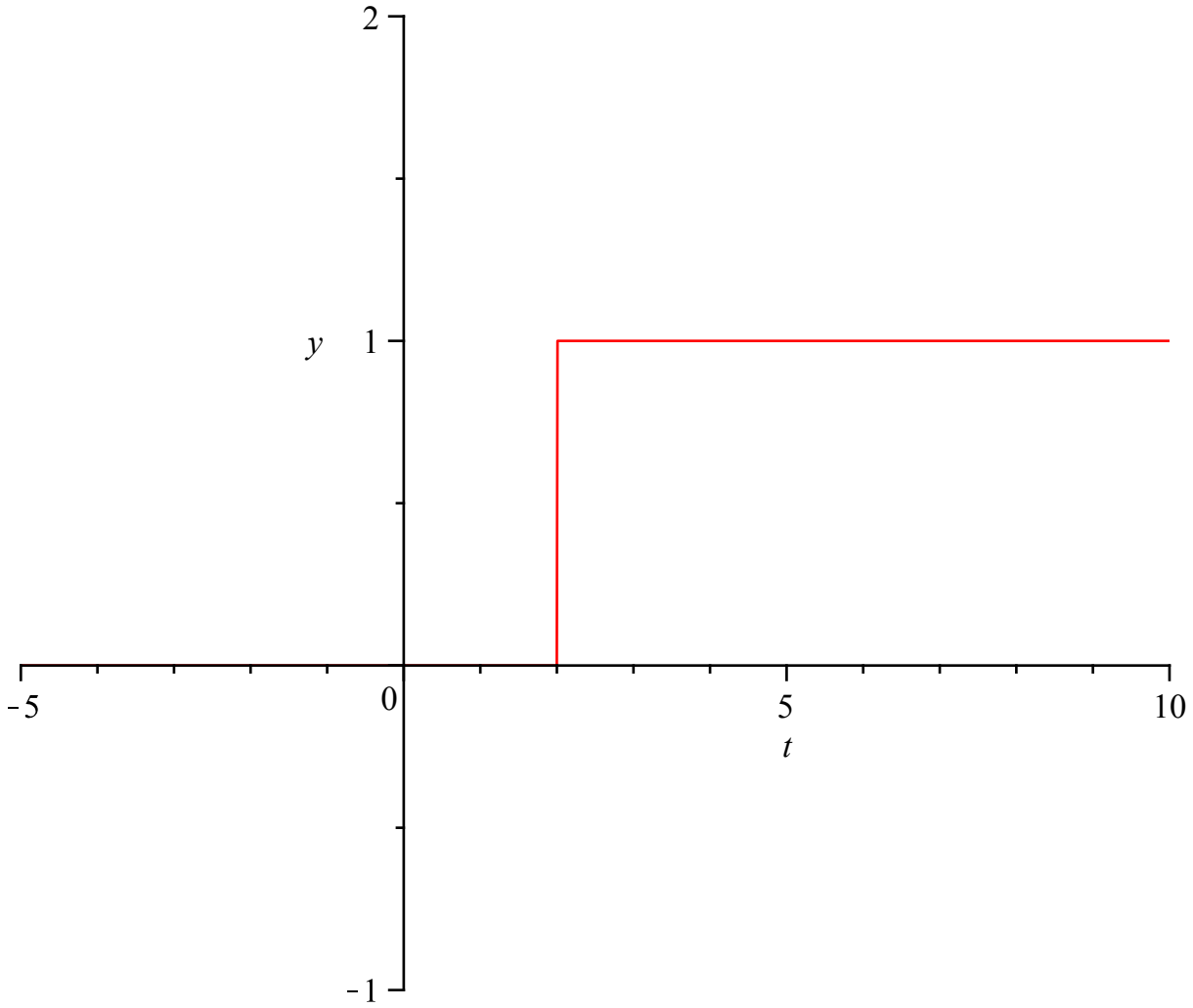
```
> ParticularSolution := invlaplace(LapTransSolution, s, t);
```

$$ParticularSolution := y(t) = -9\, e^{4t} + 10\, e^{3t} + e^{2t} \tag{5}$$

```
> restart
> u(t-2) := Heaviside(t-2);
```

$$u(t-2) := Heaviside(t-2) \tag{6}$$

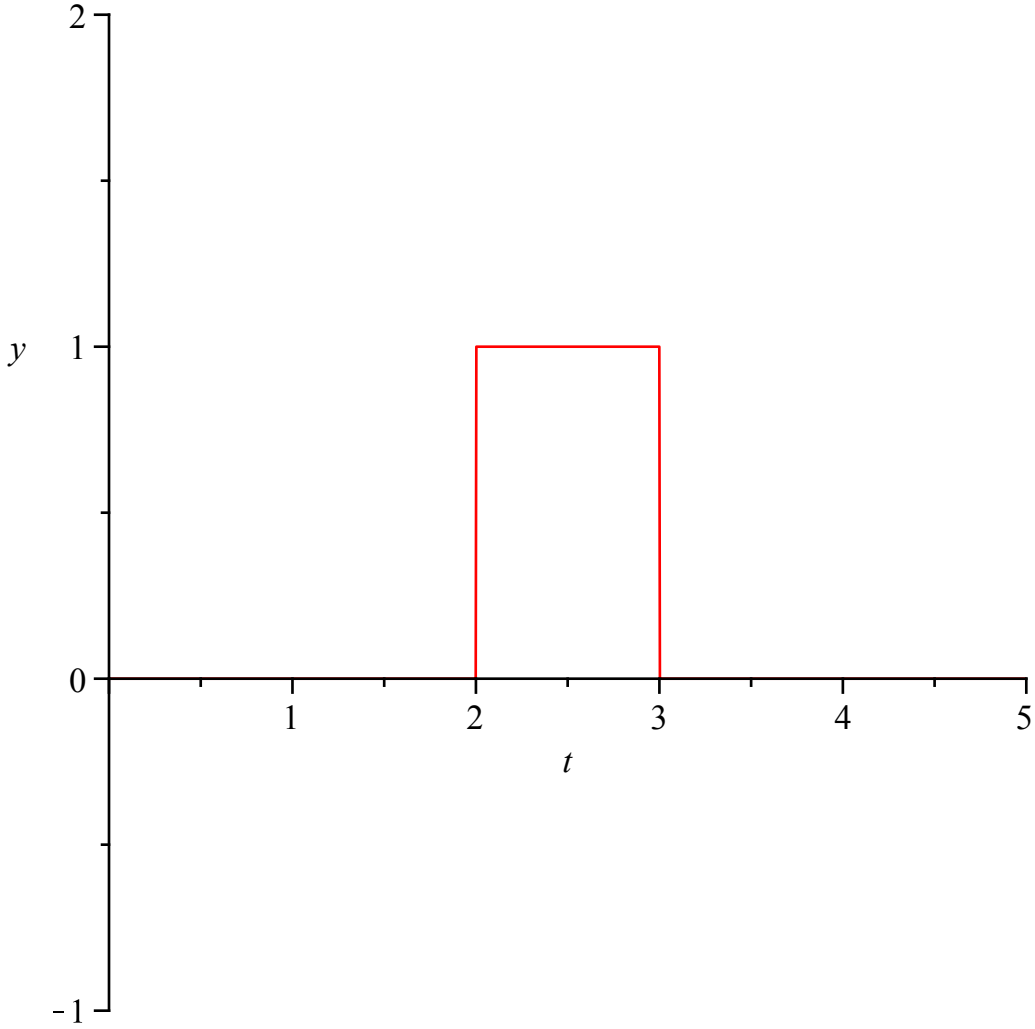
```
> plot(u(t-2), t=-5..10, y=-1..2);
```



> $f(t) := \text{Heaviside}(t-2) - \text{Heaviside}(t-3);$

$$f(t) := \text{Heaviside}(t-2) - \text{Heaviside}(t-3) \quad \textbf{(7)}$$

> $plot(f(t), t=0..5, y=-1..2);$



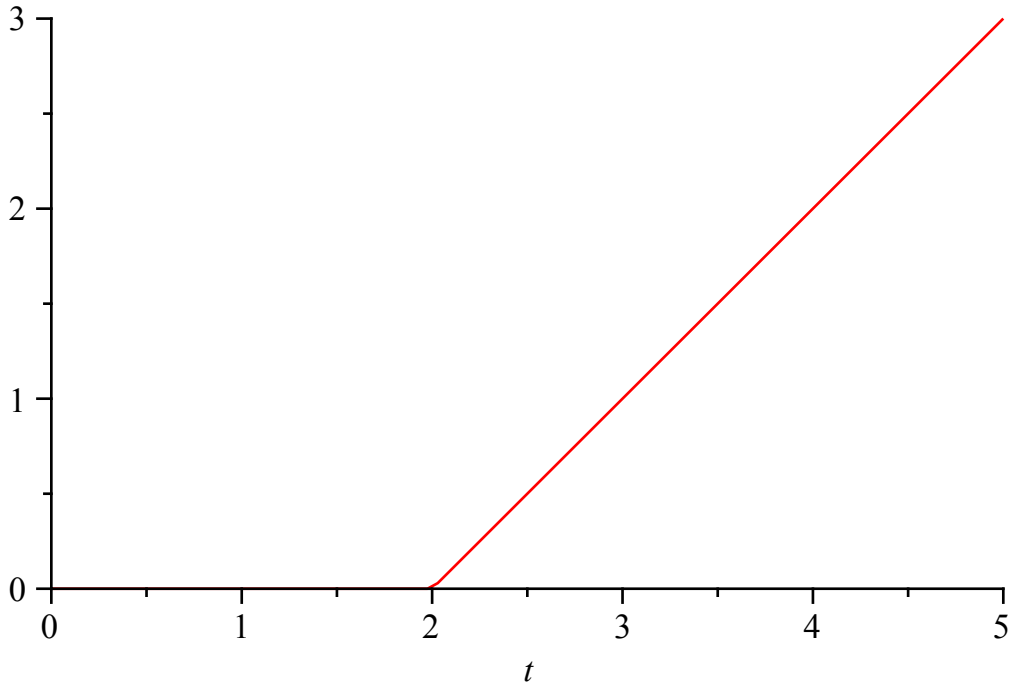

```
> with(inttrans) :
> LapTransStep := laplace(u(t-2), t, s)
```

$$LapTransStep := \frac{e^{-2s}}{s} \tag{8}$$

```
> r(t-2) := (t-2)·Heaviside(t-2);
```

$$r(t-2) := (t-2)\,\mathrm{Heaviside}(t-2) \tag{9}$$

```
> plot(r(t-2), t=0..5, scaling=CONSTRAINED);
```




```
> LapTransSlope := laplace(r(t-2), t, s);
```

$$LapTransSlope := \frac{e^{-2s}}{s^2} \quad (10)$$

```
> d(t-2) := Dirac(t-2);
```

$$d(t-2) := \mathrm{Dirac}(t-2) \quad (11)$$

```
> LapTransDelta := laplace(d(t-2), t, s);
```

$$LapTransDelta := e^{-2s} \quad (12)$$

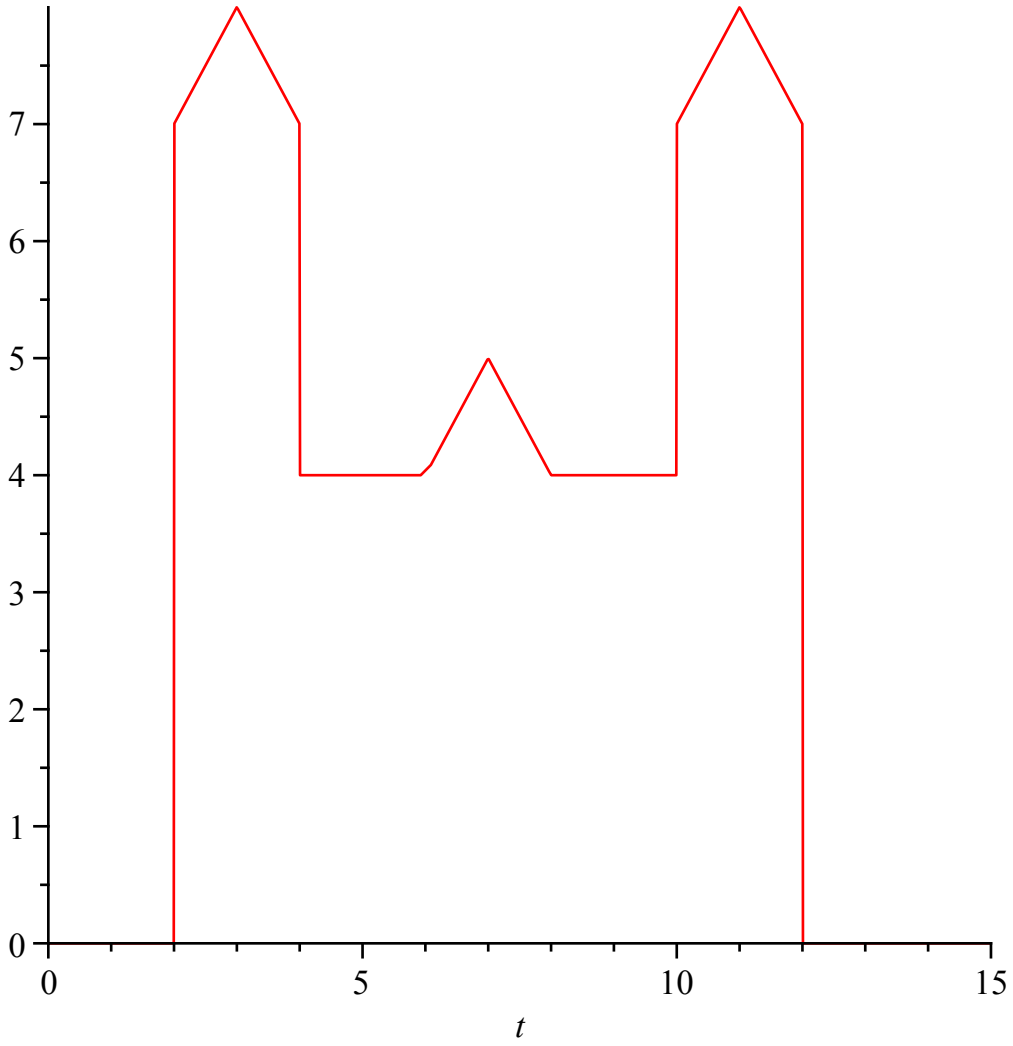
```
> diff(Heaviside(t-2), t);
```

$$\mathrm{Dirac}(t-2) \quad (13)$$

```
> restart:
> Castle(t) := 7·Heaviside(t-2) + (t-2)·Heaviside(t-2) - 2·(t-3)·Heaviside(t-3)
      + (t-4)·Heaviside(t-4) - 3·Heaviside(t-4) + (t-6)·Heaviside(t-6) - 2·(t
      - 7)·Heaviside(t-7) + (t-8)·Heaviside(t-8) + 3·Heaviside(t-10) + (t-10)
      ·Heaviside(t-10) - 2·(t-11)·Heaviside(t-11) + (t-12)·Heaviside(t-12) - 7
      ·Heaviside(t-12); plot(Castle(t), t=0..15);
```

```
Castle(t) := 7 Heaviside(t-2) + (t-2) Heaviside(t-2) - 2 (t-3) Heaviside(t-3) + (t
    - 4) Heaviside(t-4) - 3 Heaviside(t-4) + (t-6) Heaviside(t-6) - 2 (t
    - 7) Heaviside(t-7) + (t-8) Heaviside(t-8) + 3 Heaviside(t-10) + (t
```

$-10)\ \mathrm{Heaviside}(t-10) - 2\ (t-11)\ \mathrm{Heaviside}(t-11) + (t-12)\ \mathrm{Heaviside}(t-12)$
$-7\ \mathrm{Heaviside}(t-12)$




```
> with(inttrans):
> LapTransCastle := simplify(laplace(Castle(t), t, s));
```

$$LapTransCastle := -\frac{1}{s^2}\left(-e^{-2s} - e^{-12s} + 2\,e^{-11s} - e^{-10s} - e^{-8s} + 2\,e^{-7s} - e^{-6s} - e^{-4s}\right. \quad (14)$$
$$\left. + 2\,e^{-3s} - 7\,e^{-2s}s + 7\,e^{-12s}s - 3\,e^{-10s}s + 3\,e^{-4s}s\right)$$

```
>
>
>
>
>
>
```