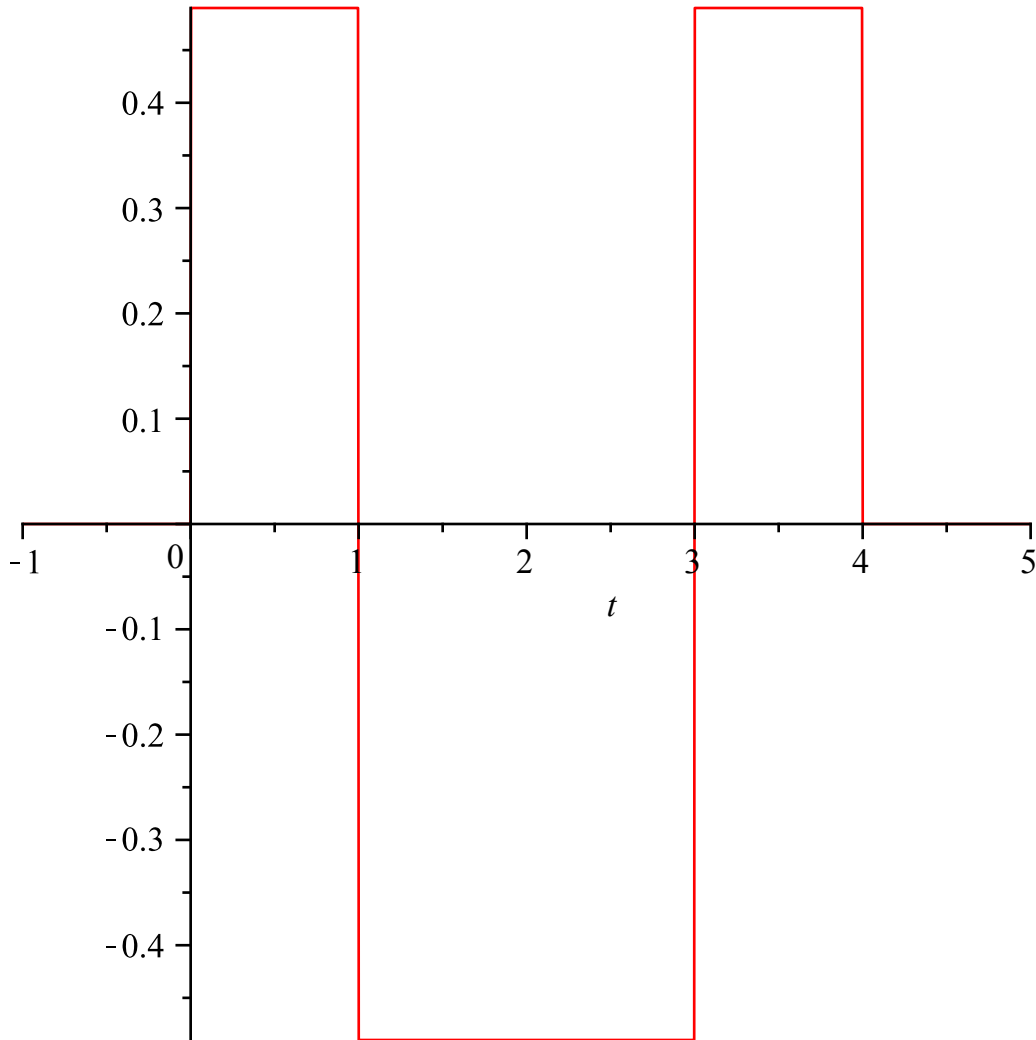


```
> restart
```

```
> G := 49/100 * Heaviside(t) - 2*49/100 * Heaviside(t - a) + 2*49/100 * Heaviside(t - 3*a) - 49/100 * Heaviside(t - 4*a); plot(subs(a = 1, G), t = -1..5)
```

```
G := 49/100 Heaviside(t) - 49/50 Heaviside(t - a) + 49/50 Heaviside(t - 3 a) - 49/100 Heaviside(t - 4 a)
```



```
> Ecuacion := diff(y(t), t$3) = G;
```

```
Ecuacion := d^3 y(t) = 49/100 Heaviside(t) - 49/50 Heaviside(t - a) + 49/50 Heaviside(t - 3 a) - 49/100 Heaviside(t - 4 a) (1)
```

```
> CondicionesIniciales := y(0) = 0, D(y)(0) = 0, D(D(y))(0) = 0
```

```
CondicionesIniciales := y(0) = 0, D(y)(0) = 0, D^(2)(y)(0) = 0 (2)
```

```
> with(inttrans) :
```

```
> TransLapEcuacion := subs(CondicionesIniciales, laplace(Ecuacion, t, s)); evalf(subs(a = 2, %), 3)
```

$$\begin{aligned} \text{TransLapEcuacion} &:= s^3 \text{laplace}(y(t), t, s) = \frac{49}{100 s} - \frac{49}{50} \text{laplace}(\text{Heaviside}(t - a), t, s) \\ &+ \frac{49}{50} \text{laplace}(\text{Heaviside}(t - 3 a), t, s) - \frac{49}{100} \text{laplace}(\text{Heaviside}(t - 4 a), t, s) \\ s^3 \text{laplace}(y(t), t, s) &= \frac{0.490}{s} - 0.980 \text{laplace}(\text{Heaviside}(t - 2), t, s) \end{aligned} \quad (3)$$

> $\text{TransLapSolucion} := \text{isolate}(\text{TransLapEcuacion}, \text{laplace}(y(t), t, s)); \text{evalf}(\text{subs}(a = 2, \%), 3)$

$$\begin{aligned} \text{TransLapSolucion} &:= \text{laplace}(y(t), t, s) = \frac{1}{s^3} \left(\frac{49}{100 s} - \frac{49}{50} \text{laplace}(\text{Heaviside}(t - a), t, s) \right. \\ &+ \frac{49}{50} \text{laplace}(\text{Heaviside}(t - 3 a), t, s) - \frac{49}{100} \text{laplace}(\text{Heaviside}(t - 4 a), t, s) \left. \right) \\ \text{laplace}(y(t), t, s) &= \frac{1}{s^3} \left(\frac{0.490}{s} - 0.980 \text{laplace}(\text{Heaviside}(t - 2), t, s) \right. \\ &+ 0.980 \text{laplace}(\text{Heaviside}(t - 6), t, s) - 0.490 \text{laplace}(\text{Heaviside}(t - 8), t, s) \left. \right) \end{aligned} \quad (4)$$

> $\text{TransLapSolucion};$

$$\begin{aligned} \text{laplace}(y(t), t, s) &= \frac{1}{s^3} \left(\frac{49}{100 s} - \frac{49}{50} \text{laplace}(\text{Heaviside}(t - a), t, s) \right. \\ &+ \frac{49}{50} \text{laplace}(\text{Heaviside}(t - 3 a), t, s) - \frac{49}{100} \text{laplace}(\text{Heaviside}(t - 4 a), t, s) \left. \right) \end{aligned} \quad (5)$$

> $\text{Solucion} := \text{invlaplace}(\text{TransLapSolucion}, s, t)$

$$\begin{aligned} \text{Solucion} &:= y(t) = \frac{49}{600} t^3 - \frac{49}{50} \text{Heaviside}(-a) a^3 - \frac{49}{600} \text{Heaviside}(t - 4 a) (t - 4 a)^3 \\ &+ \frac{49}{300} \text{Heaviside}(t - 3 a) (t - 3 a)^3 - \frac{49}{300} \text{Heaviside}(t - a) (t - a)^3 \end{aligned} \quad (6)$$

> $\text{EcuacionReal} := \text{subs}(t = 4 a, \text{rhs}(\text{Solucion})) = 225$

$$\begin{aligned} \text{EcuacionReal} &:= \frac{392}{75} a^3 - \frac{49}{50} \text{Heaviside}(-a) a^3 + \frac{49}{300} \text{Heaviside}(a) a^3 \\ &- \frac{441}{100} \text{Heaviside}(3 a) a^3 = 225 \end{aligned} \quad (7)$$

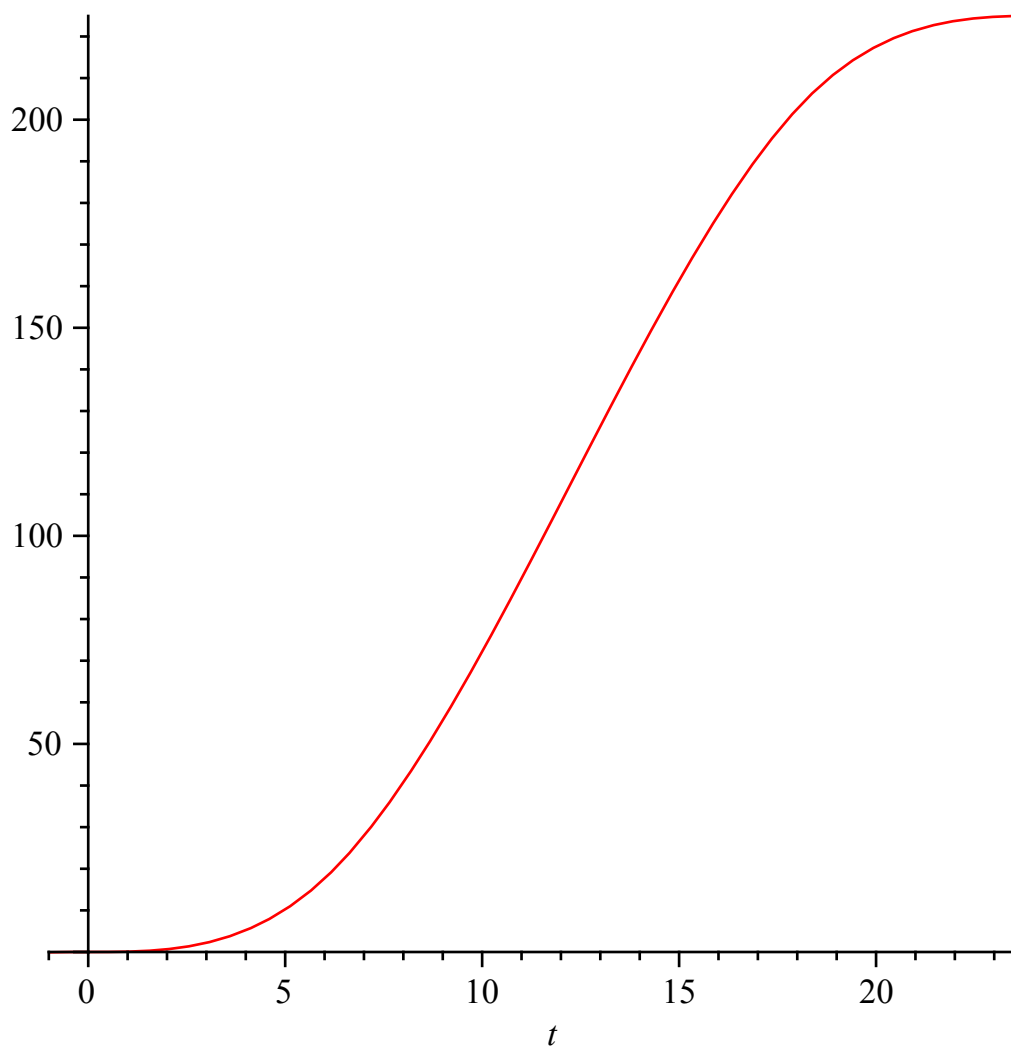
> $\text{parametro} := \text{solve}(\text{subs}(\text{Heaviside}(a) = 1, \text{Heaviside}(3 a) = 1, \text{Heaviside}(-a) = 0, \text{EcuacionReal}), a); \text{evalf}(\%, 3)$

$$\begin{aligned} \text{parametro} &:= \frac{5}{7} 630^{1/3}, -\frac{5}{14} 630^{1/3} + \frac{5}{14} i \sqrt{3} 630^{1/3}, -\frac{5}{14} 630^{1/3} - \frac{5}{14} i \sqrt{3} 630^{1/3} \\ &6.12, -3.06 + 5.28 i, -3.06 - 5.28 i \end{aligned} \quad (8)$$

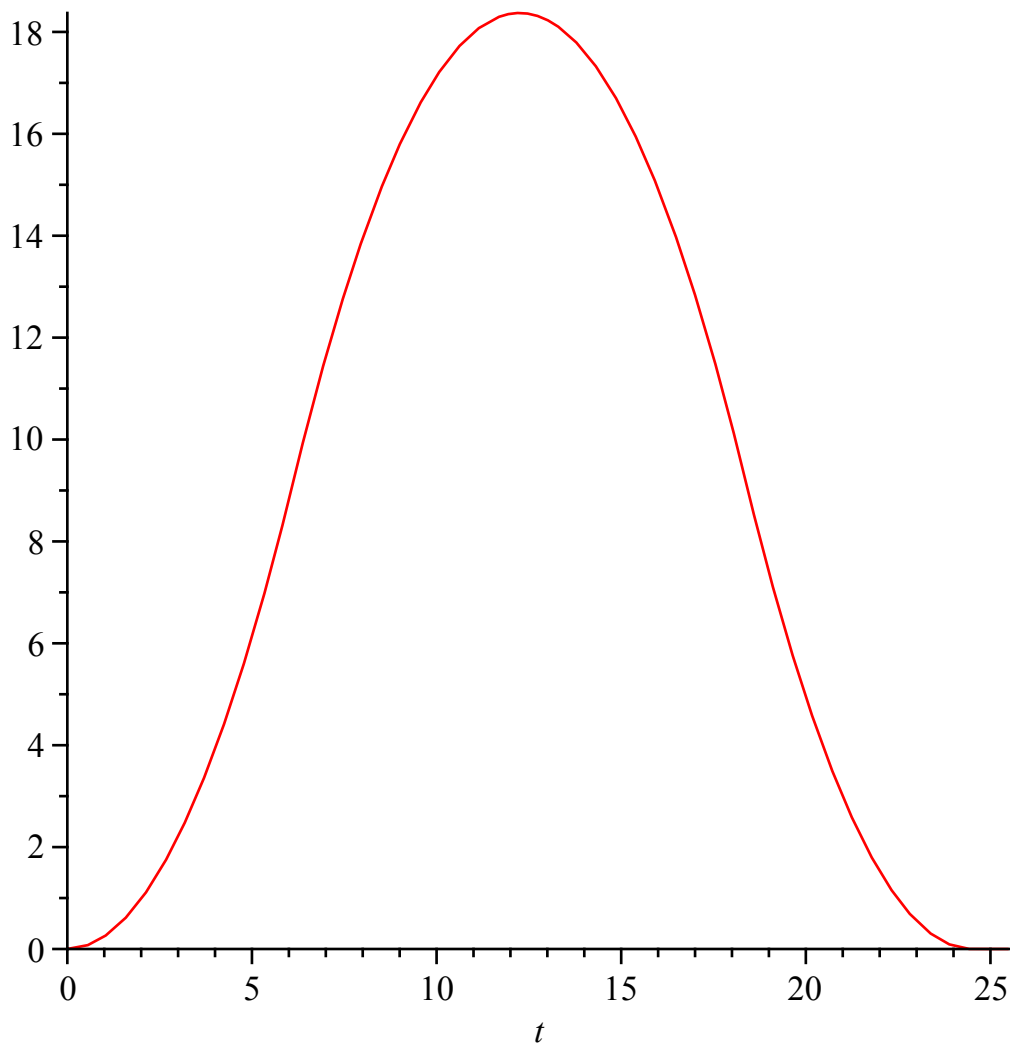
> $\text{TiempoFinal} := 4 \cdot \text{parametro}_1; \text{evalf}(\%, 5)$

$$24.493 \quad (9)$$

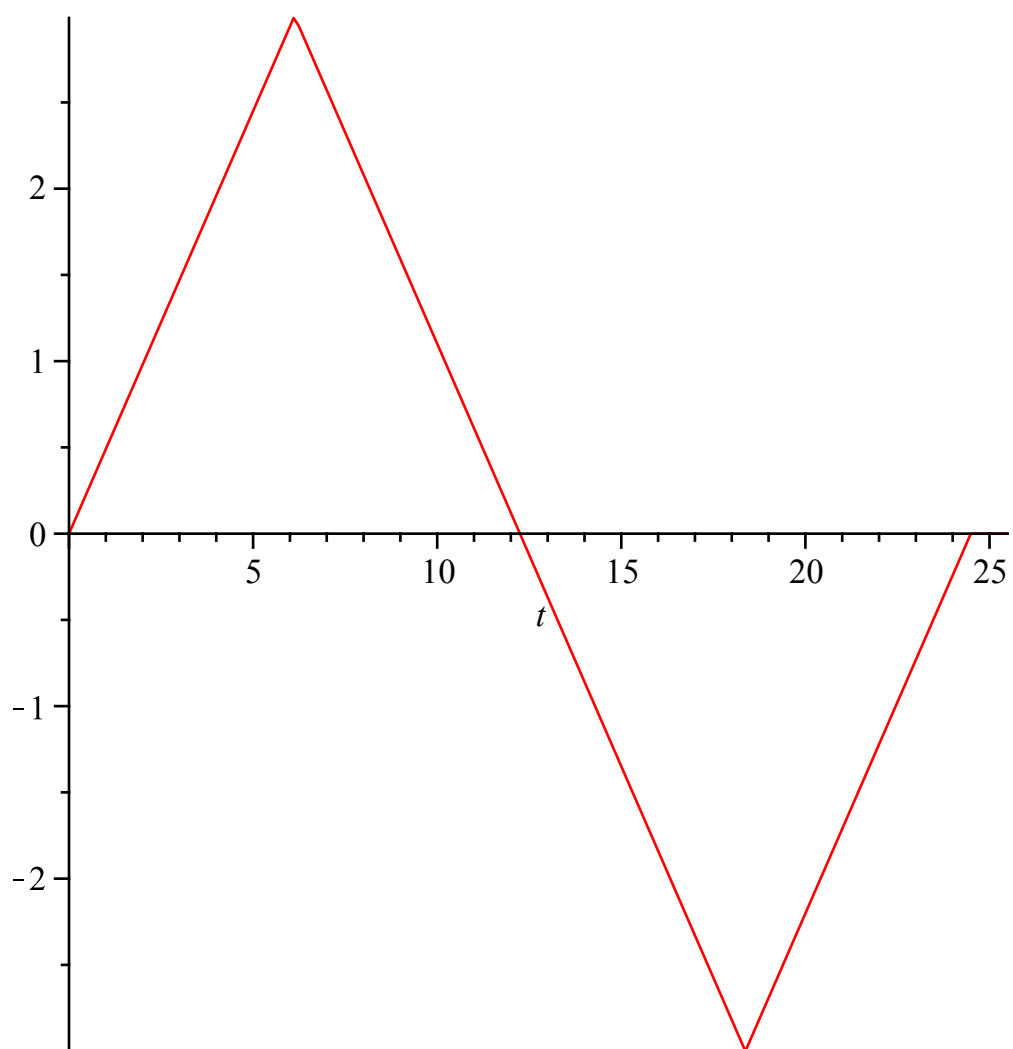
> $\text{SolucionFinal} := \text{subs}(a = \text{parametro}_1, \text{Solucion}); \text{plot}(\text{rhs}(\text{SolucionFinal}), t = -1 \dots \text{TiempoFinal} - 1)$



=
> `plot(rhs(diff(SolucionFinal, t)), t=0..TiempoFinal+1)`



=
> `plot(rhs(diff(SolucionFinal, t$2)), t=0..TiempoFinal + 1)`



`> plot(rhs(diff(SolucionFinal, t$3)), t=0..TiempoFinal + 1)`

