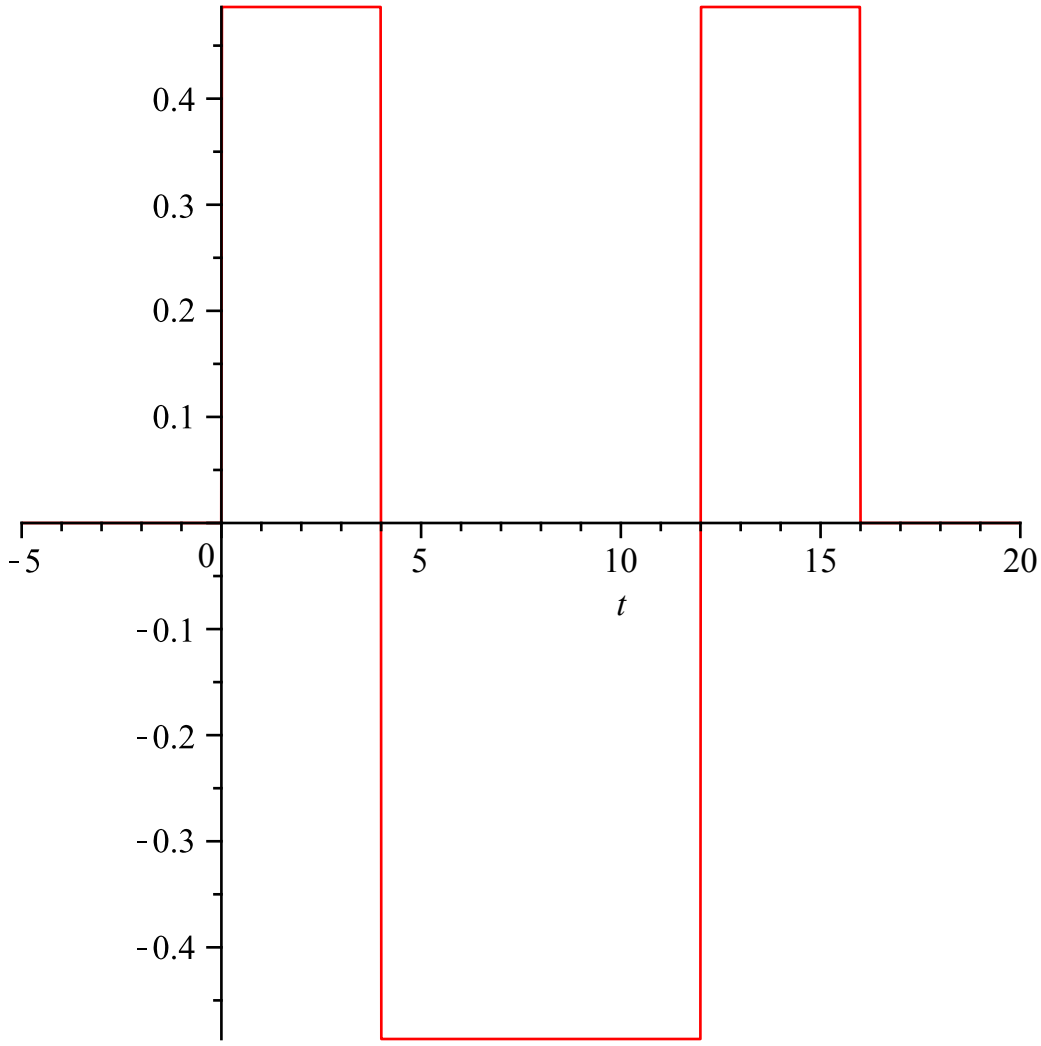
```
> restart
> s(t) := 4864/10000 · Heaviside(t) − 2·4864/10000 ·Heaviside(t − a) + 2·4864/10000 ·Heaviside(t − 3·a)
      − 4864/10000 ·Heaviside(t − 4·a); plot(subs(a = 4, s(t)), t = −5 ..20)
```

$$s(t) := \frac{304}{625}\ \text{Heaviside}(t) - \frac{608}{625}\ \text{Heaviside}(t-a) + \frac{608}{625}\ \text{Heaviside}(t-3\,a) - \frac{304}{625}\ \text{Heaviside}(t-4\,a)$$




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

$$Ecuacion := \frac{d^3}{dt^3}\,y(t) = \frac{304}{625}\ \text{Heaviside}(t) - \frac{608}{625}\ \text{Heaviside}(t-a) + \frac{608}{625}\ \text{Heaviside}(t-3\,a) - \frac{304}{625}\ \text{Heaviside}(t-4\,a) \quad \textbf{(1)}$$

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

$$CondicionesIniciales := y(0) = 0,\ D(y)(0) = 0,\ D^{(2)}(y)(0) = 0 \quad \textbf{(2)}$$

```
> with(inttrans) :
> TransLapEcuacion := subs(CondicionesIniciales, laplace(Ecuacion, t, s))
```

$$TransLapEcuacion := s^3\, laplace(y(t), t, s) = \frac{304}{625\, s} - \frac{608}{625}\, laplace(\text{Heaviside}(t-a), t, s) \quad (3)$$
$$+ \frac{608}{625}\, laplace(\text{Heaviside}(t-3\,a), t, s) - \frac{304}{625}\, laplace(\text{Heaviside}(t-4\,a), t, s)$$

> $TransLapSolucion := isolate(TransLapEcuacion, laplace(y(t), t, s))$

$$TransLapSolucion := laplace(y(t), t, s) = \frac{1}{s^3}\left(\frac{304}{625\, s} - \frac{608}{625}\, laplace(\text{Heaviside}(t-a), t, s)\right. \quad (4)$$
$$\left. + \frac{608}{625}\, laplace(\text{Heaviside}(t-3\,a), t, s) - \frac{304}{625}\, laplace(\text{Heaviside}(t-4\,a), t, s)\right)$$

> $SolucionParticular := invlaplace(TransLapSolucion, s, t)$

$$SolucionParticular := y(t) = \frac{152}{1875}\, t^3 - \frac{608}{625}\, \text{Heaviside}(-a)\, a^3 - \frac{152}{1875}\, \text{Heaviside}(t-4\,a)\, (t \quad (5)$$
$$-4\,a)^3 + \frac{304}{1875}\, \text{Heaviside}(t-3\,a)\, (t-3\,a)^3 - \frac{304}{1875}\, \text{Heaviside}(t-a)\, (t-a)^3$$

> $altura := subs(t = 4\cdot a, a = 6.136, rhs(SolucionParticular)) : evalf(\%, 4)$

$$225. \quad (6)$$

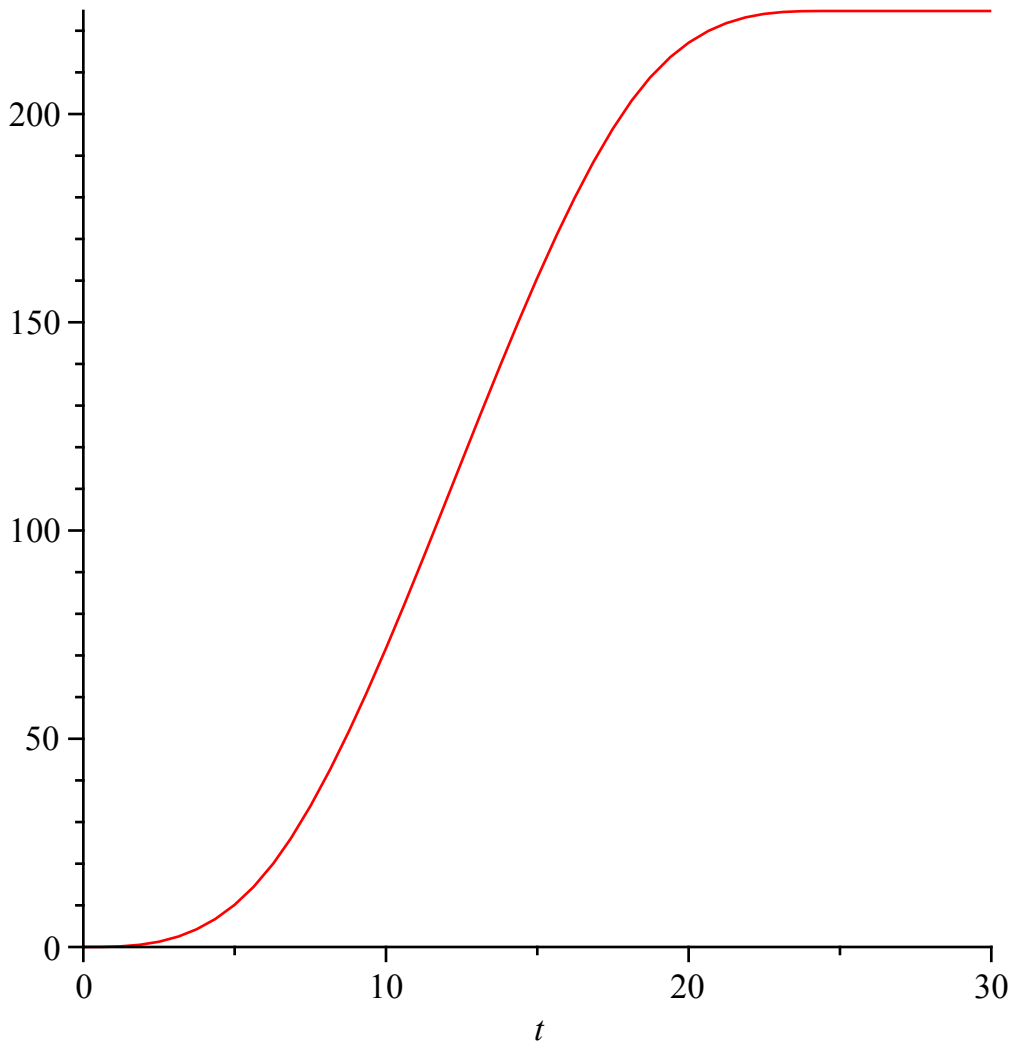
> $TiempoFinal := 4 \cdot 6.136 : evalf(\%, 4)$

$$24.54 \quad (7)$$

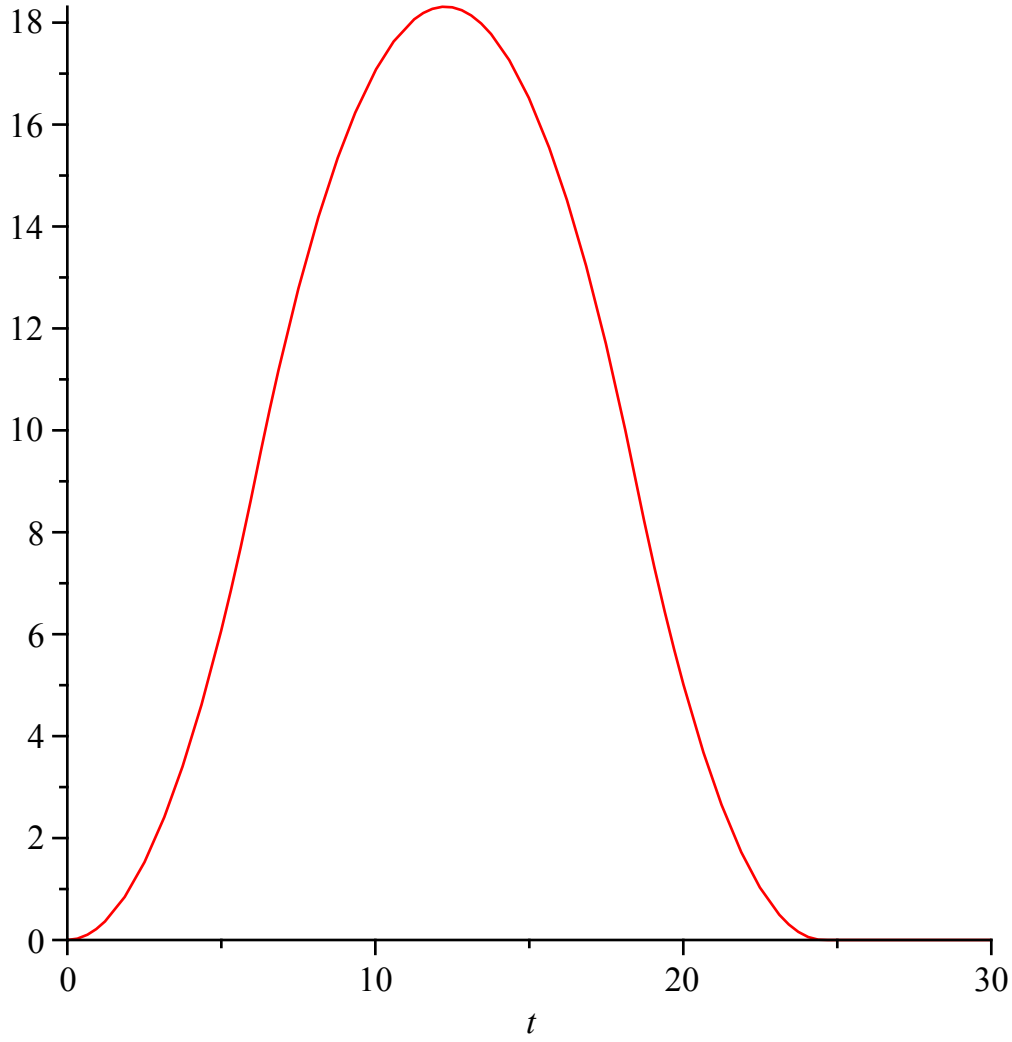
> $Solucion := subs(a = 6.136, SolucionParticular)$

$$Solucion := y(t) = \frac{152}{1875}\, t^3 - 224.7396058\, \text{Heaviside}(-6.136) - \frac{152}{1875}\, \text{Heaviside}(t \quad (8)$$
$$-24.544)\, (t-24.544)^3 + \frac{304}{1875}\, \text{Heaviside}(t-18.408)\, (t-18.408)^3$$
$$- \frac{304}{1875}\, \text{Heaviside}(t-6.136)\, (t-6.136)^3$$

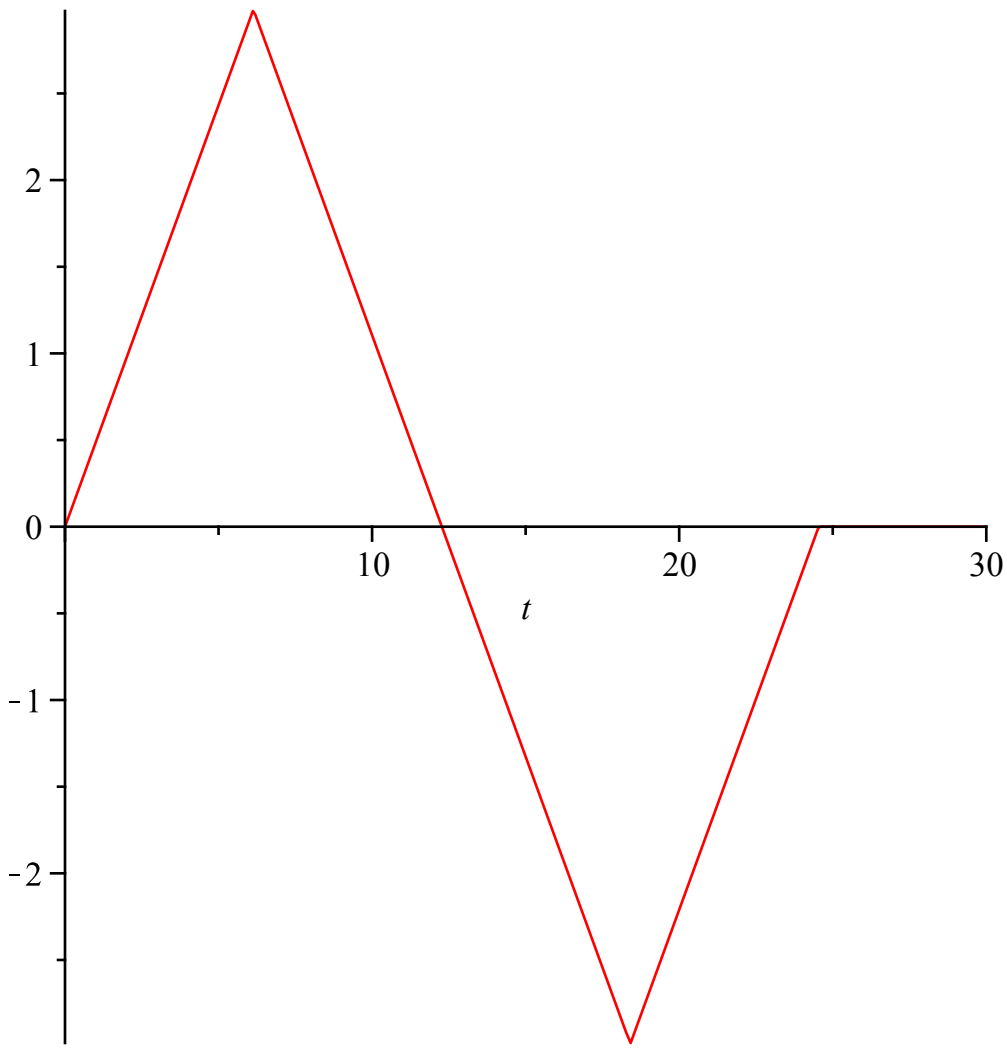
> $plot(rhs(Solucion), t = 0..30)$



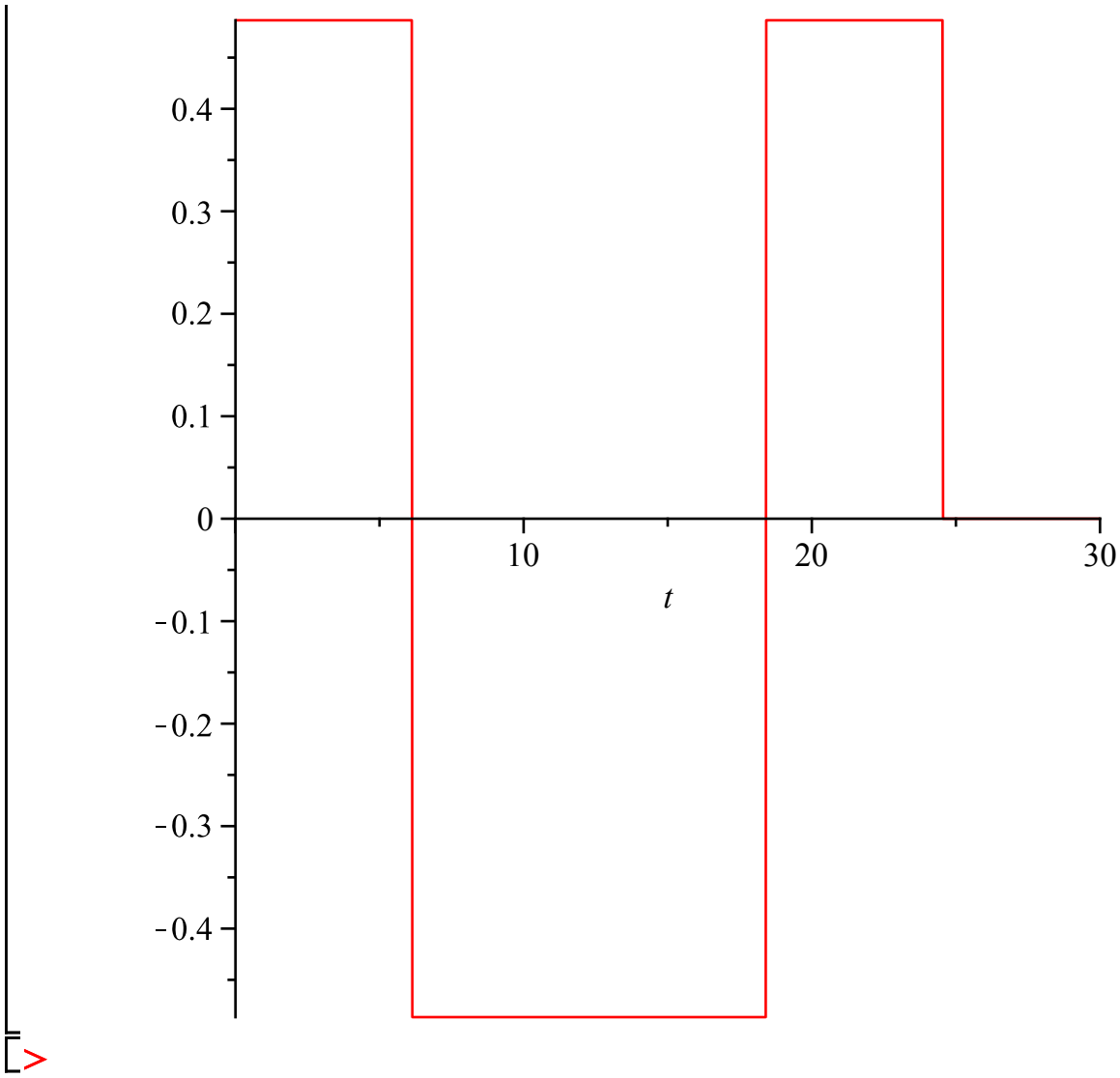

```
> plot(rhs(diff(Solucion, t)), t = 0..30)
```




```
> plot(rhs(diff(Solucion, t$2)), t = 0..30)
```




```
> plot(rhs(diff(Solucion, t$3)), t = 0..30)
```


0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
10
20
30
t

>