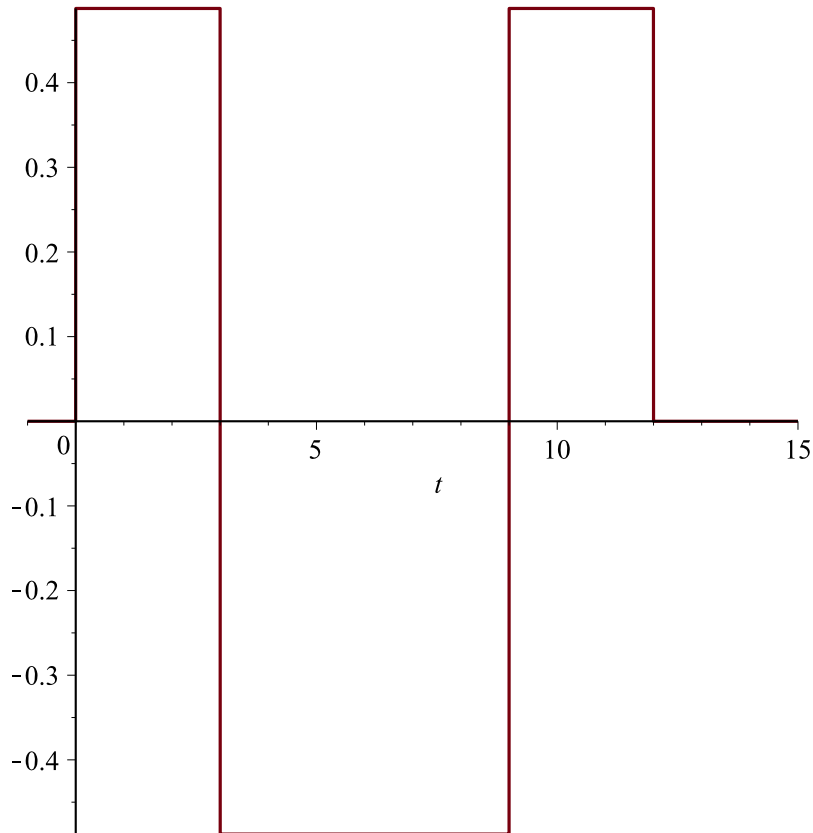


> restart

> Ecuacion := diff(y(t), t\$3) = $\frac{48768}{100000} \cdot \text{Heaviside}(t) - 2 \cdot \frac{48768}{100000} \cdot \text{Heaviside}(t - a) + 2$
 $\cdot \frac{48768}{100000} \cdot \text{Heaviside}(t - 3 \cdot a) - \frac{48768}{100000} \cdot \text{Heaviside}(t - 4 \cdot a)$

Ecuacion := $\frac{d^3}{dt^3} y(t) = \frac{1524}{3125} \text{Heaviside}(t) - \frac{3048}{3125} \text{Heaviside}(t - a) + \frac{3048}{3125} \text{Heaviside}(t$
 $- 3 a) - \frac{1524}{3125} \text{Heaviside}(t - 4 a)$ (1)

> plot(subs(a=3, rhs(Ecuacion)), t=-1..15)



> Condiciones := y(0) = 0, D(y)(0) = 0, D(D(y))(0) = 0

Condiciones := y(0) = 0, D(y)(0) = 0, D⁽²⁾(y)(0) = 0 (2)

> with(inttrans) :

> EcuaTF := subs(Condiciones, laplace(Ecuacion, t, s))

EcuaTF := $s^3 \text{laplace}(y(t), t, s) = \frac{1524}{3125 s} - \frac{3048}{3125} \text{laplace}(\text{Heaviside}(t - a), t, s)$
 $+ \frac{3048}{3125} \text{laplace}(\text{Heaviside}(t - 3 a), t, s) - \frac{1524}{3125} \text{laplace}(\text{Heaviside}(t - 4 a), t, s)$ (3)

$$\begin{aligned}
 &> \text{SolTF} := \text{isolate}(\text{EcuaTF}, \text{laplace}(y(t), t, s)) \\
 \text{SolTF} &:= \text{laplace}(y(t), t, s) = \frac{1}{s^3} \left(\frac{1524}{3125 s} - \frac{3048}{3125} \text{laplace}(\text{Heaviside}(t - a), t, s) \right. \\
 &\quad \left. + \frac{3048}{3125} \text{laplace}(\text{Heaviside}(t - 3 a), t, s) - \frac{1524}{3125} \text{laplace}(\text{Heaviside}(t - 4 a), t, s) \right)
 \end{aligned} \tag{4}$$

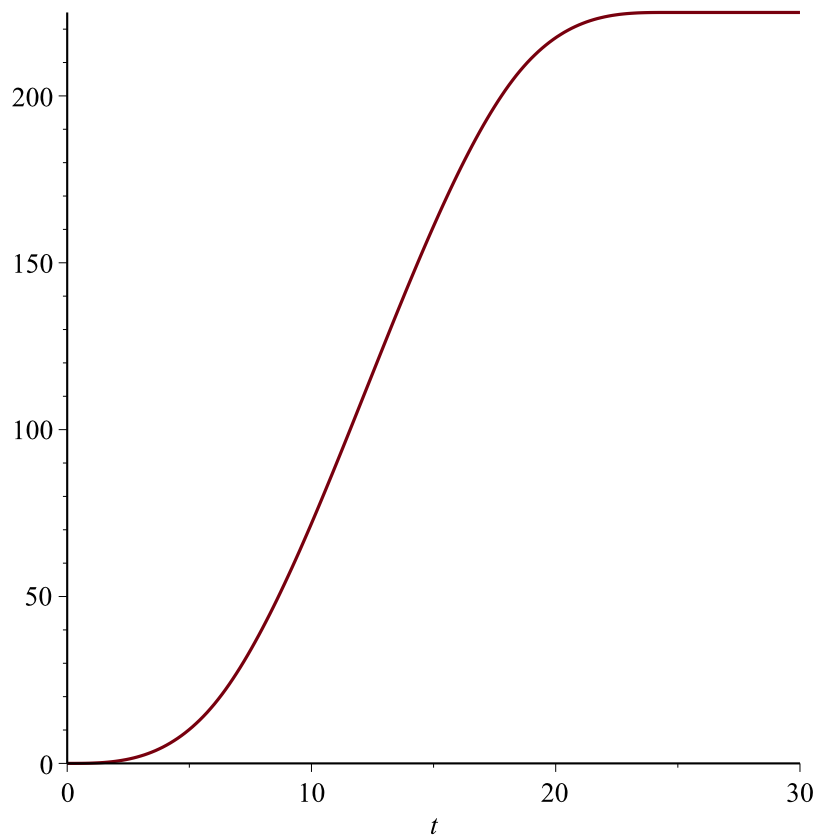
$$\begin{aligned}
 &> \text{Solucion} := \text{invlaplace}(\text{SolTF}, s, t) \\
 \text{Solucion} &:= y(t) = \frac{254}{3125} t^3 - \frac{3048}{3125} \text{Heaviside}(-a) a^3 - \frac{254}{3125} \text{Heaviside}(t - 4 a) (t - 4 a)^3 \\
 &\quad + \frac{508}{3125} \text{Heaviside}(t - 3 a) (t - 3 a)^3 - \frac{508}{3125} \text{Heaviside}(t - a) (t - a)^3
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 &> \text{SolucionDos} := \text{subs}(\text{Heaviside}(-a) = 0, \text{Heaviside}(t - 4 a) = 0, \text{Heaviside}(t - 3 a) = 1, \\
 &\quad \text{Heaviside}(t - a) = 1, \text{Solucion}) \\
 \text{SolucionDos} &:= y(t) = \frac{254}{3125} t^3 + \frac{508}{3125} (t - 3 a)^3 - \frac{508}{3125} (t - a)^3
 \end{aligned} \tag{6}$$

$$\begin{aligned}
 &> \text{EcuaAlg} := \text{subs}(t = 4 \cdot a, \text{rhs}(\text{SolucionDos}) = 225) \\
 \text{EcuaAlg} &:= \frac{3048}{3125} a^3 = 225
 \end{aligned} \tag{7}$$

$$\begin{aligned}
 &> \text{Para} := \text{solve}(\text{EcuaAlg}, a) : \text{evalf}(\%, 3) \\
 &\quad 6.13, -3.07 + 5.31 I, -3.07 - 5.31 I
 \end{aligned} \tag{8}$$

$$> \text{SolucionFinal} := \text{subs}(a = \text{Para}[1], \text{Solucion}) : \text{plot}(\text{rhs}(\text{SolucionFinal}), t = 0 .. 30)$$

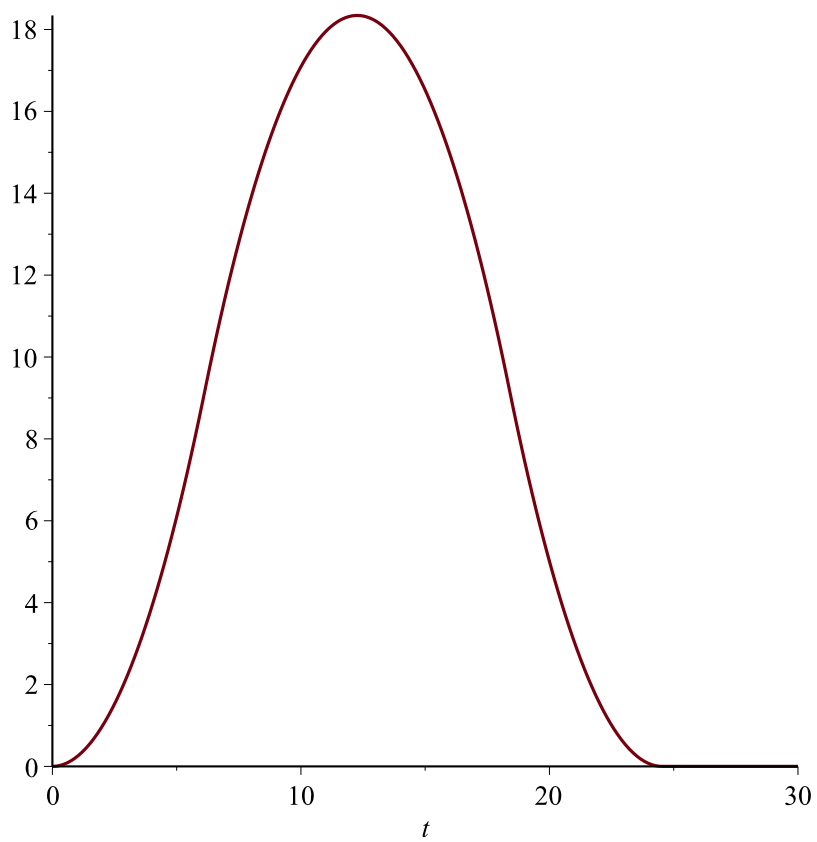


```

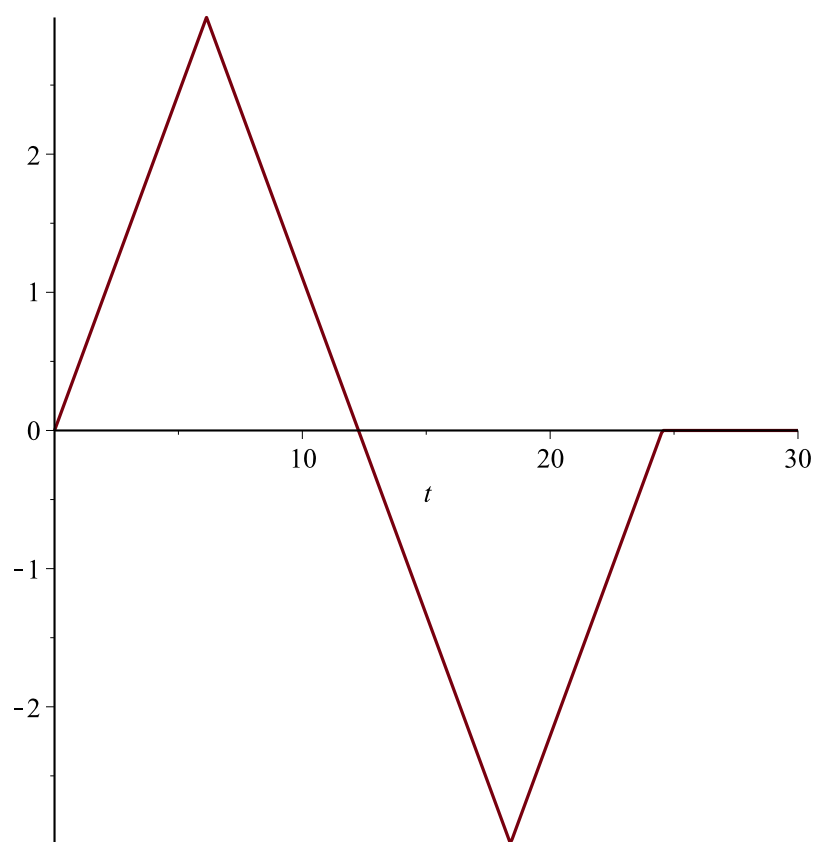
> TiempoFinal := 4·Para[1] : evalf(%)
24.53197520
> plot(rhs(diff(SolucionFinal, t)), t = 0 .. 30)

```

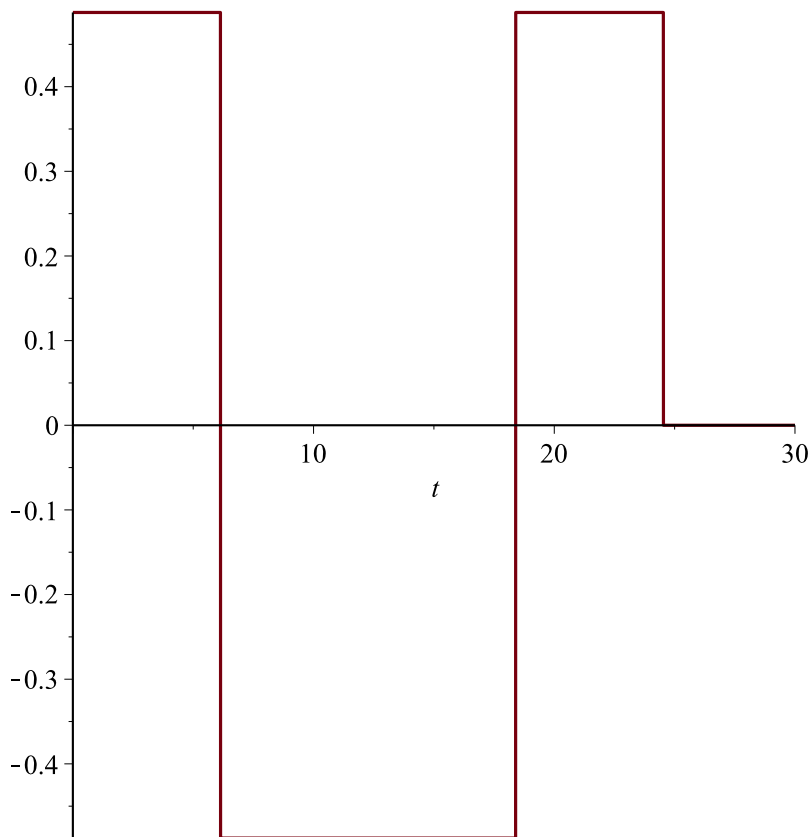
(9)



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



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



```

> restart
> with(LinearAlgebra) :
> AA := Matrix( [[3, 4], [-2, 5]])

```

$$AA := \begin{bmatrix} 3 & 4 \\ -2 & 5 \end{bmatrix} \quad (10)$$

```

> MatExp := MatrixExponential(AA, t)

```

$$MatExp := \begin{bmatrix} e^{4t} \cos(t\sqrt{7}) - \frac{1}{7} e^{4t} \sin(t\sqrt{7}) \sqrt{7} & \frac{4}{7} e^{4t} \sin(t\sqrt{7}) \sqrt{7} \\ -\frac{2}{7} e^{4t} \sin(t\sqrt{7}) \sqrt{7} & e^{4t} \cos(t\sqrt{7}) + \frac{1}{7} e^{4t} \sin(t\sqrt{7}) \sqrt{7} \end{bmatrix} \quad (11)$$

```

> Identidad := map(rcurry(eval, t=0'), MatExp)

```

$$Identidad := \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (12)$$

```

> Comprob := evalm(map(diff, MatExp, t) - evalm(AA &* MatExp)) = 0

```

(13)

|
=
|>
|=
|>

$$Comprob := \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$$

(13)