```
> restart
```

Problema de la cuerda de guitarra de 1 mt largo y rasgando 1 mm

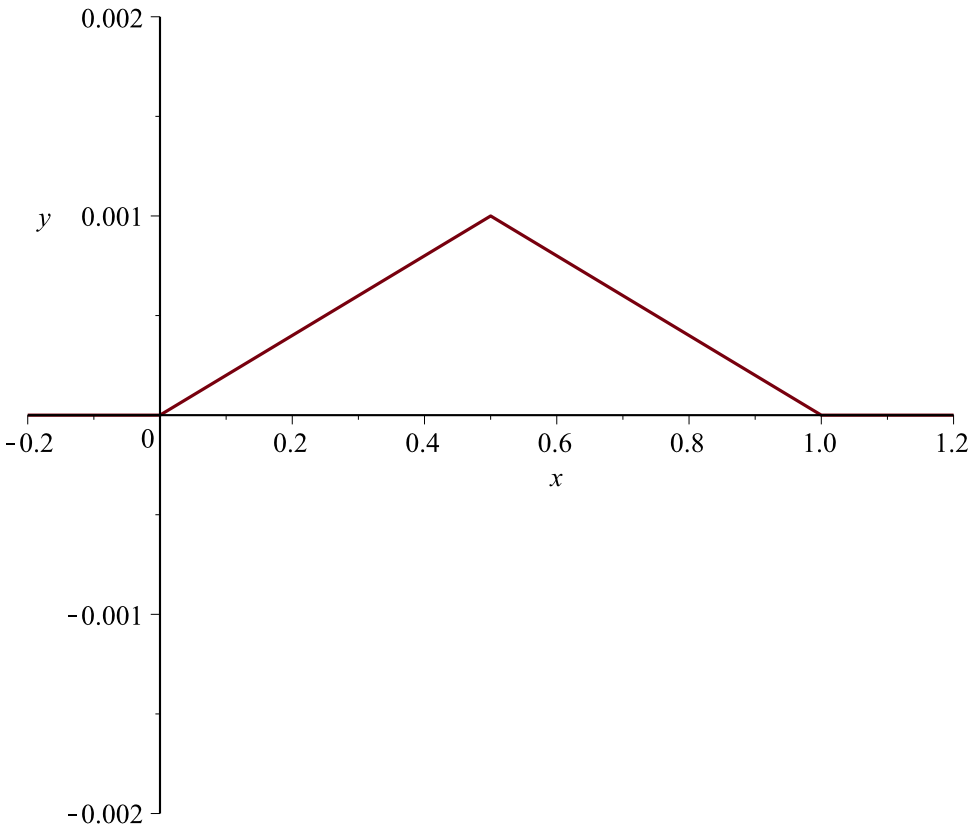
```
> Ecua := diff(y(x, t), t$2) = c^2·diff(y(x, t), x$2)
```

$$Ecua := \frac{\partial^2}{\partial t^2} y(x, t) = c^2 \left(\frac{\partial^2}{\partial x^2} y(x, t) \right) \tag{1}$$

```
> CondIniTray := f = (1/1000)/(5/10)·x·Heaviside(x) - 2·(1/1000)/(5/10)·(x - 5/10)·Heaviside(x - 5/10)
  + (1/1000)/(5/10)·(x - 1)·Heaviside(x - 1)
```

$$CondIniTray := f = \frac{1}{500} x \,\text{Heaviside}(x) - \frac{1}{250} \left(x - \frac{1}{2} \right) \text{Heaviside}\left(x - \frac{1}{2} \right) + \frac{1}{500} (x - 1) \,\text{Heaviside}(x - 1) \tag{2}$$

```
> plot(rhs(CondIniTray), x = -0.2 ..1.2, y = -0.002 ..0.002)
```




```
> CondIniVel := 0
```

(3)

$$CondIniVel := 0 \tag{3}$$

> $CondFrontera := F(0) = 0, F(1) = 0$

$$CondFrontera := F(0) = 0, F(1) = 0 \tag{4}$$

> $Hipotesis := y(x, t) = F(x) \cdot G(t)$

$$Hipotesis := y(x, t) = F(x)\ G(t) \tag{5}$$

> $EcuaSep := eval(subs(y(x, t) = rhs(Hipotesis), c^2 = 1, Ecua))$

$$EcuaSep := F(x)\left(\frac{d^2}{dt^2} G(t)\right) = \left(\frac{d^2}{dx^2} F(x)\right) G(t) \tag{6}$$

> $EcuaSeparada := simplify\left(\frac{lhs(EcuaSep)}{F(x) \cdot G(t)}\right) = simplify\left(\frac{rhs(EcuaSep)}{F(x) \cdot G(t)}\right)$

$$EcuaSeparada := \frac{\frac{d^2}{dt^2} G(t)}{G(t)} = \frac{\frac{d^2}{dx^2} F(x)}{F(x)} \tag{7}$$

> $EcuaX := rhs(EcuaSeparada) = \text{alpha}$

$$EcuaX := \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \alpha \tag{8}$$

> $EcuaT := lhs(EcuaSeparada) = \text{alpha}$

$$EcuaT := \frac{\frac{d^2}{dt^2} G(t)}{G(t)} = \alpha \tag{9}$$

> $EcuaXneg := subs(\text{alpha} = -\beta^2, EcuaX)$

$$EcuaXneg := \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = -\beta^2 \tag{10}$$

> $SolXneg := dsolve(EcuaXneg)$

$$SolXneg := F(x) = \_C1 \sin(\beta x) + \_C2 \cos(\beta x) \tag{11}$$

> $ParaDos := simplify(subs(x = 0, rhs(SolXneg) = 0))$

$$ParaDos := \_C2 = 0 \tag{12}$$

> $SolXnegBis := subs(\_C2 = rhs(ParaDos), SolXneg)$

$$SolXnegBis := F(x) = \_C1 \sin(n \pi x) \tag{13}$$

> $\text{beta} := n \cdot \text{Pi}$

$$\beta := n \pi \tag{14}$$

> $SolXnegPart := SolXnegBis$

$$SolXnegPart := F(x) = \_C1 \sin(n \pi x) \tag{15}$$

> $EcuaTneg := subs(\text{alpha} = -\beta^2, EcuaT)$

$$EcuaTneg := \frac{\frac{d^2}{dt^2} G(t)}{G(t)} = -n^2 \pi^2 \tag{16}$$

> $SolTneg := dsolve(EcuaTneg)$

$$SolTneg := G(t) = \_C1 \sin(n \pi t) + \_C2 \cos(n \pi t) \quad \textbf{(17)}$$

```
> SolUno := y(x, t) = subs(_C1 = 1, rhs(SolXnegPart)) · rhs(SolTneg)
```

$$SolUno := y(x, t) = \sin(n \pi x) \left(\_C1 \sin(n \pi t) + \_C2 \cos(n \pi t) \right) \quad \textbf{(18)}$$

```
>
```