

```

> restart
> Ecuacion := diff(z(x, y), x$2) = 5·diff(z(x, y), y)
      Ecuacion :=  $\frac{\partial^2}{\partial x^2} z(x, y) = 5 \left( \frac{\partial}{\partial y} z(x, y) \right)$  (1)

```

---

```

> Solucion := pdsolve(Ecuacion)
Solucion := (z(x, y) = _F1(x) _F2(y)) &where  $\left[ \left\{ \frac{d^2}{dx^2} _F1(x) = _c1 _F1(x), \frac{d}{dy} _F2(y) \right. \right.$ 
       $\left. = \frac{1}{5} _c1 _F2(y) \right\}$ 

```

---

```

> with(PDEtools) :
> SolucionGeneral := build(Solucion)
      SolucionGeneral :=  $z(x, y) = e^{\sqrt{-c_1} x} _C3 e^{\frac{1}{5} -c_1 y} _C1 + \frac{ _C3 e^{\frac{1}{5} -c_1 y} _C2}{e^{\sqrt{-c_1} x}}$  (3)

```

---

```

> restart
> Ecuacion := diff(y(x, t), t$2) + 4·diff(y(x, t), x) = y(x, t)
      Ecuacion :=  $\frac{\partial^2}{\partial t^2} y(x, t) + 4 \left( \frac{\partial}{\partial x} y(x, t) \right) = y(x, t)$  (4)

```

---

```

> EcuacionDos := eval(subs(y(x, t) = F(x)·G(t), Ecuacion))
      EcuacionDos :=  $F(x) \left( \frac{d^2}{dt^2} G(t) \right) + 4 \left( \frac{d}{dx} F(x) \right) G(t) = F(x) G(t)$  (5)

```

---

```

> EcuacionTres := lhs(EcuacionDos) - 4·diff(F(x), x)·G(t) = rhs(EcuacionDos) - 4
      ·diff(F(x), x)·G(t)
      EcuacionTres :=  $F(x) \left( \frac{d^2}{dt^2} G(t) \right) = F(x) G(t) - 4 \left( \frac{d}{dx} F(x) \right) G(t)$  (6)

```

---

```

> EcuacionCuatro :=  $\frac{lhs(EcuacionTres)}{F(x) \cdot G(t)} = simplify\left(\frac{rhs(EcuacionTres)}{F(x) \cdot G(t)}\right)$ 
      EcuacionCuatro :=  $\frac{\frac{d^2}{dt^2} G(t)}{G(t)} = \frac{F(x) - 4 \left( \frac{d}{dx} F(x) \right)}{F(x)}$  (7)

```

---

```

> EcuacionT := lhs(EcuacionCuatro) = alpha
      EcuacionT :=  $\frac{\frac{d^2}{dt^2} G(t)}{G(t)} = \alpha$  (8)

```

---

```

> EcuacionX := rhs(EcuacionCuatro) = alpha
      EcuacionX :=  $\frac{F(x) - 4 \left( \frac{d}{dx} F(x) \right)}{F(x)} = \alpha$  (9)

```

---

```

> SolucionTcero := dsolve(subs(alpha=0, EcuacionT))
      SolucionTcero :=  $G(t) = _C1 t + _C2$  (10)

```

---

```

> SolucionXcero := dsolve(subs(alpha=0, EcuacionX))

```

$$\text{SolucionXcero} := F(x) = \_C1 e^{\frac{1}{4}x} \quad (11)$$

$$> \text{SolucionGeneralCero} := y(x, t) = \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionXcero})) \cdot \text{rhs}(\text{SolucionTcero})$$

$$\text{SolucionGeneralCero} := y(x, t) = e^{\frac{1}{4}x} (\_C1 t + \_C2) \quad (12)$$

$$> \text{SolucionTpos} := \text{dsolve}(\text{subs}(\text{alpha} = \text{beta} \cdot 2, \text{EcuacionT}))$$

$$\text{SolucionTpos} := G(t) = \_C1 e^{-\beta t} + \_C2 e^{\beta t} \quad (13)$$

$$> \text{SolucionXpos} := \text{dsolve}(\text{subs}(\text{alpha} = \text{beta} \cdot 2, \text{EcuacionX}))$$

$$\text{SolucionXpos} := F(x) = \_C1 e^{-\frac{1}{4}(\beta - 1)(\beta + 1)x} \quad (14)$$

$$> \text{SolucionGeneralPositiva} := y(x, t) = \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionXpos})) \cdot \text{rhs}(\text{SolucionTpos})$$

$$\text{SolucionGeneralPositiva} := y(x, t) = e^{-\frac{1}{4}(\beta - 1)(\beta + 1)x} (\_C1 e^{-\beta t} + \_C2 e^{\beta t}) \quad (15)$$

$$> \text{SolucionTneg} := \text{dsolve}(\text{subs}(\text{alpha} = -\text{beta} \cdot 2, \text{EcuacionT}))$$

$$\text{SolucionTneg} := G(t) = \_C1 \sin(\beta t) + \_C2 \cos(\beta t) \quad (16)$$

$$> \text{SolucionXneg} := \text{dsolve}(\text{subs}(\text{alpha} = -\text{beta} \cdot 2, \text{EcuacionX}))$$

$$\text{SolucionXneg} := F(x) = \_C1 e^{\frac{1}{4}(\beta^2 + 1)x} \quad (17)$$

$$> \text{SolucionGeneralNegativa} := y(x, t) = \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionXneg})) \cdot \text{rhs}(\text{SolucionTneg})$$

$$\text{SolucionGeneralNegativa} := y(x, t) = e^{\frac{1}{4}(\beta^2 + 1)x} (\_C1 \sin(\beta t) + \_C2 \cos(\beta t)) \quad (18)$$

$$> \text{SolucionMaquina} := \text{pdsolve}(\text{Ecuacion})$$

$$\text{SolucionMaquina} := (y(x, t) = \_F1(x) \_F2(t)) \&\text{where} \left[ \left\{ \frac{d}{dx} \_F1(x) = \_c1 \_F1(x), \right. \right. \quad (19)$$

$$\left. \left. \frac{d^2}{dt^2} \_F2(t) = -4 \_c1 \_F2(t) + \_F2(t) \right\} \right]$$

$$> \text{with}(\text{PDEtools}) :$$

$$> \text{SolucionFinal} := \text{build}(\text{SolucionMaquina})$$

$$\text{SolucionFinal} := y(x, t) = \_C1 e^{-\frac{c}{4}x} \_C2 \sin(\sqrt{4 \_c1 - 1} t) \quad (20)$$

$$+ \_C1 e^{-\frac{c}{4}x} \_C3 \cos(\sqrt{4 \_c1 - 1} t)$$

>