> *restart*

> $EcuaDerPar := diff(z(x,y), x\$2) + 5\cdot diff(z(x,y), y) = z(x,y)$

$$EcuaDerPar := \frac{\partial^2}{\partial x^2} z(x,y) + 5 \frac{\partial}{\partial y} z(x,y) = z(x,y) \tag{1}$$

> $HipotesisCero := z(x,y) = P(x)\cdot Q(y)$

$$HipotesisCero := z(x,y) = P(x)\, Q(y) \tag{2}$$

> $EcuaDos := eval(subs(z(x,y) = rhs(HipotesisCero), EcuaDerPar))$

$$EcuaDos := \left(\frac{d^2}{dx^2} P(x)\right) Q(y) + 5\, P(x) \left(\frac{d}{dy} Q(y)\right) = P(x)\, Q(y) \tag{3}$$

> $EcuaTres := lhs(EcuaDos) - 5\, P(x) \left(\frac{d}{dy} Q(y)\right) - P(x)\, Q(y) = rhs(EcuaDos) - 5\, P(x) \left(\frac{d}{dy} Q(y)\right) - P(x)\, Q(y)$

$$EcuaTres := \left(\frac{d^2}{dx^2} P(x)\right) Q(y) - P(x)\, Q(y) = -5\, P(x) \left(\frac{d}{dy} Q(y)\right) \tag{4}$$

> $EcuaCuatro := simplify\left(\frac{lhs(EcuaTres)}{-5\cdot P(x)\cdot Q(y)}\right) = \frac{rhs(EcuaTres)}{-5\cdot P(x)\cdot Q(y)}$

$$EcuaCuatro := \frac{-\frac{d^2}{dx^2} P(x) + P(x)}{5\, P(x)} = \frac{\frac{d}{dy} Q(y)}{Q(y)} \tag{5}$$

> $EcuaX := lhs(EcuaCuatro) = \mathrm{alpha}$

$$EcuaX := \frac{-\frac{d^2}{dx^2} P(x) + P(x)}{5\, P(x)} = \alpha \tag{6}$$

> $EcuaY := rhs(EcuaCuatro) = \mathrm{alpha}$

$$EcuaY := \frac{\frac{d}{dy} Q(y)}{Q(y)} = \alpha \tag{7}$$

> $EcuaXcero := subs(\mathrm{alpha} = 0, EcuaX)$

$$EcuaXcero := \frac{-\frac{d^2}{dx^2} P(x) + P(x)}{5\, P(x)} = 0 \tag{8}$$

> $EcuaYcero := subs(\mathrm{alpha} = 0, EcuaY)$

$$EcuaYcero := \frac{\frac{d}{dy} Q(y)}{Q(y)} = 0 \tag{9}$$

> $SolGralXcero := dsolve(EcuaXcero)$

$$SolGralXcero := P(x) = c_1\, e^{x} + c_2\, e^{-x} \tag{10}$$

> $SolGralYcero := dsolve(EcuaYcero)$

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$$SolGralYcero := Q(y) = c_1 \tag{11}$$

> $SolGralCero := z(x,y) = rhs(SolGralXcero) \cdot rhs(SolGralYcero)$

$$SolGralCero := z(x,y) = \left(c_1\,\mathrm{e}^{x} + c_2\,\mathrm{e}^{-x}\right) c_1 \tag{12}$$

> $SolGralFinalCero := z(x,y) = \_C10 \cdot \exp(x) + \_C20 \cdot \exp(-x)$

$$SolGralFinalCero := z(x,y) = \_C10\,\mathrm{e}^{x} + \_C20\,\mathrm{e}^{-x} \tag{13}$$

> $EcuaDerPar$

$$\frac{\partial^2}{\partial x^2} z(x,y) + 5 \frac{\partial}{\partial y} z(x,y) = z(x,y) \tag{14}$$

> $ComprobarCero := simplify(eval(subs(z(x,y) = rhs(SolGralFinalCero), lhs(EcuaDerPar) - rhs(EcuaDerPar) = 0)))$

$$ComprobarCero := 0 = 0 \tag{15}$$

> $EcuaXpos := subs\left(\text{alpha} = \beta^2, EcuaX\right)$

$$EcuaXpos := \frac{-\frac{\mathrm{d}^2}{\mathrm{d}x^2} P(x) + P(x)}{5\,P(x)} = \beta^2 \tag{16}$$

> $EcuaYpos := subs\left(\text{alpha} = \beta^2, EcuaY\right)$

$$EcuaYpos := \frac{\frac{\mathrm{d}}{\mathrm{d}y} Q(y)}{Q(y)} = \beta^2 \tag{17}$$

> $SolXpos := dsolve(EcuaXpos)$

$$SolXpos := P(x) = c_1 \sin\left(\sqrt{5\,\beta^2 - 1}\; x\right) + c_2 \cos\left(\sqrt{5\,\beta^2 - 1}\; x\right) \tag{18}$$

> $SolYpos := dsolve(EcuaYpos)$

$$SolYpos := Q(y) = c_1\,\mathrm{e}^{\beta^2 y} \tag{19}$$

> $SolGralPos := z(x,y) = rhs(SolXpos) \cdot \left(subs\left(c_1 = 1, rhs(SolYpos)\right)\right)$

$$SolGralPos := z(x,y) = \left(c_1 \sin\left(\sqrt{5\,\beta^2 - 1}\; x\right) + c_2 \cos\left(\sqrt{5\,\beta^2 - 1}\; x\right)\right) \mathrm{e}^{\beta^2 y} \tag{20}$$

> $ComprobarPos := simplify(eval(subs(z(x,y) = rhs(SolGralPos), lhs(EcuaDerPar) - rhs(EcuaDerPar) = 0)))$

$$ComprobarPos := 0 = 0 \tag{21}$$

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

$$EcuaXneg := \frac{-\frac{\mathrm{d}^2}{\mathrm{d}x^2} P(x) + P(x)}{5\,P(x)} = -\beta^2 \tag{22}$$

> $EcuaYneg := subs\left(\text{alpha} = -\beta^2, EcuaY\right)$

$$EcuaYneg := \frac{\frac{\mathrm{d}}{\mathrm{d}y} Q(y)}{Q(y)} = -\beta^2 \tag{23}$$

> $SolXneg := dsolve(EcuaXneg)$

$$SolXneg := P(x) = c_1 \sin\left(\sqrt{-5\,\beta^2 - 1}\ x\right) + c_2 \cos\left(\sqrt{-5\,\beta^2 - 1}\ x\right) \tag{24}$$

> $SolYneg := dsolve(EcuaYneg)$

$$SolYneg := Q(y) = c_1\, \mathrm{e}^{-\beta^2 y} \tag{25}$$

> $SolGralNeg := z(x, y) = rhs(SolXneg) \cdot \left(subs\left(c_1 = 1, rhs(SolYneg)\right)\right)$

$$SolGralNeg := z(x, y) = \left(c_1 \sin\left(\sqrt{-5\,\beta^2 - 1}\ x\right) + c_2 \cos\left(\sqrt{-5\,\beta^2 - 1}\ x\right)\right) \mathrm{e}^{-\beta^2 y} \tag{26}$$

> $EcuaDerPar$

$$\frac{\partial^2}{\partial x^2}\, z(x, y) + 5\, \frac{\partial}{\partial y}\, z(x, y) = z(x, y) \tag{27}$$

> $ComprobarNeg := simplify(eval(subs(z(x, y) = rhs(SolGralNeg), lhs(EcuaDerPar)$
> $\quad - rhs(EcuaDerPar) = 0)))$

$$ComprobarNeg := 0 = 0 \tag{28}$$

> $EcuaTres$

$$\left(\frac{\mathrm{d}^2}{\mathrm{d}x^2}\, P(x)\right) Q(y) - P(x)\, Q(y) = -5\, P(x) \left(\frac{\mathrm{d}}{\mathrm{d}y}\, Q(y)\right) \tag{29}$$

> $EcuaCinco := lhs(EcuaTres) + P(x) \cdot Q(y) = rhs(EcuaTres) + P(x) \cdot Q(y)$

$$EcuaCinco := \left(\frac{\mathrm{d}^2}{\mathrm{d}x^2}\, P(x)\right) Q(y) = -5\, P(x) \left(\frac{\mathrm{d}}{\mathrm{d}y}\, Q(y)\right) + P(x)\, Q(y) \tag{30}$$

> $EcuaSeis := \dfrac{lhs(EcuaCinco)}{5 \cdot P(x) \cdot Q(y)} = simplify\left(\dfrac{rhs(EcuaCinco)}{5 \cdot P(x) \cdot Q(y)}\right)$

$$EcuaSeis := \frac{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\, P(x)}{5\, P(x)} = \frac{-5\, \frac{\mathrm{d}}{\mathrm{d}y}\, Q(y) + Q(y)}{5\, Q(y)} \tag{31}$$

> $EcuaXX := lhs(EcuaSeis) = \mathrm{gamma}$

$$EcuaXX := \frac{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\, P(x)}{5\, P(x)} = \gamma \tag{32}$$

> $EcuaYY := rhs(EcuaSeis) = \mathrm{gamma}$

$$EcuaYY := \frac{-5\, \frac{\mathrm{d}}{\mathrm{d}y}\, Q(y) + Q(y)}{5\, Q(y)} = \gamma \tag{33}$$

> $EcuaXXcero := subs(\mathrm{gamma} = 0, EcuaXX)$

$$EcuaXXcero := \frac{\frac{\mathrm{d}^2}{\mathrm{d}x^2}\, P(x)}{5\, P(x)} = 0 \tag{34}$$

> $EcuaYYcero := subs(\mathrm{gamma} = 0, EcuaYY)$

$$EcuaYYcero := \frac{-5\, \frac{\mathrm{d}}{\mathrm{d}y}\, Q(y) + Q(y)}{5\, Q(y)} = 0 \tag{35}$$

> $SolXXcero := dsolve(EcuaXXcero)$

$$SolXXcero := P(x) = c_1\, x + c_2 \tag{36}$$

> $SolYYcero := dsolve(EcuaYYcero)$

$$SolYYcero := Q(y) = c_1\, e^{\frac{y}{5}} \tag{37}$$

> $SolGralDosCero := z(x, y) = rhs(SolXXcero) \cdot subs\left(c_1 = 1, rhs(SolYYcero)\right)$

$$SolGralDosCero := z(x, y) = \left(c_1\, x + c_2\right) e^{\frac{y}{5}} \tag{38}$$

> $EcuaDerPar$

$$\frac{\partial^2}{\partial x^2} z(x, y) + 5 \frac{\partial}{\partial y} z(x, y) = z(x, y) \tag{39}$$

> $ComprobarDosCero := simplify(eval(subs(z(x, y) = rhs(SolGralDosCero), lhs(EcuaDerPar) - rhs(EcuaDerPar) = 0)))$

$$ComprobarDosCero := 0 = 0 \tag{40}$$

> $EcuaXXpos := subs\left(\mathrm{gamma} = \delta^2, EcuaXX\right)$

$$EcuaXXpos := \frac{\frac{d^2}{dx^2} P(x)}{5\, P(x)} = \delta^2 \tag{41}$$

> $EcuaYYpos := subs\left(\mathrm{gamma} = \delta^2, EcuaYY\right)$

$$EcuaYYpos := \frac{-5 \frac{d}{dy} Q(y) + Q(y)}{5\, Q(y)} = \delta^2 \tag{42}$$

> $SolXXpos := dsolve(EcuaXXpos)$

$$SolXXpos := P(x) = c_1\, e^{\sqrt{5}\, \delta x} + c_2\, e^{-\sqrt{5}\, \delta x} \tag{43}$$

> $SolYYpos := dsolve(EcuaYYpos)$

$$SolYYpos := Q(y) = c_1\, e^{-\frac{(5\delta^2 - 1) y}{5}} \tag{44}$$

> $SolGralDosPos := z(x, y) = rhs(SolXXpos) \cdot subs\left(c_1 = 1, rhs(SolYYpos)\right)$

$$SolGralDosPos := z(x, y) = \left(c_1\, e^{\sqrt{5}\, \delta x} + c_2\, e^{-\sqrt{5}\, \delta x}\right) e^{-\frac{(5\delta^2 - 1) y}{5}} \tag{45}$$

> $EcuaDerPar$

$$\frac{\partial^2}{\partial x^2} z(x, y) + 5 \frac{\partial}{\partial y} z(x, y) = z(x, y) \tag{46}$$

> $ComprobarDosPos := simplify(eval(subs(z(x, y) = rhs(SolGralDosPos), lhs(EcuaDerPar) - rhs(EcuaDerPar) = 0)))$

$$ComprobarDosPos := 0 = 0 \tag{47}$$

> $EcuaXXneg := subs\left(\mathrm{gamma} = -\delta^2, EcuaXX\right)$

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$$EcuaXXneg := \frac{\frac{d^2}{dx^2} P(x)}{5\, P(x)} = -\delta^2 \tag{48}$$

> $EcuaYYneg := subs\left(\mathrm{gamma} = -\delta^2, EcuaYY\right)$

$$EcuaYYneg := \frac{-5 \frac{d}{dy} Q(y) + Q(y)}{5\, Q(y)} = -\delta^2 \tag{49}$$

> $SolXXneg := dsolve(EcuaXXneg)$

$$SolXXneg := P(x) = c_1 \sin\left(\sqrt{5}\, \delta x\right) + c_2 \cos\left(\sqrt{5}\, \delta x\right) \tag{50}$$

> $SolYYneg := dsolve(EcuaYYneg)$

$$SolYYneg := Q(y) = c_1\, \mathrm{e}^{\frac{(5\delta^2+1)\, y}{5}} \tag{51}$$

> $SolGralDosNeg := z(x, y) = rhs(SolXXneg) \cdot subs\left(c_1 = 1, rhs(SolYYneg)\right)$

$$SolGralDosNeg := z(x, y) = \left(c_1 \sin\left(\sqrt{5}\, \delta x\right) + c_2 \cos\left(\sqrt{5}\, \delta x\right)\right) \mathrm{e}^{\frac{(5\delta^2+1)\, y}{5}} \tag{52}$$

> $EcuaDerPar$

$$\frac{\partial^2}{\partial x^2} z(x, y) + 5 \frac{\partial}{\partial y} z(x, y) = z(x, y) \tag{53}$$

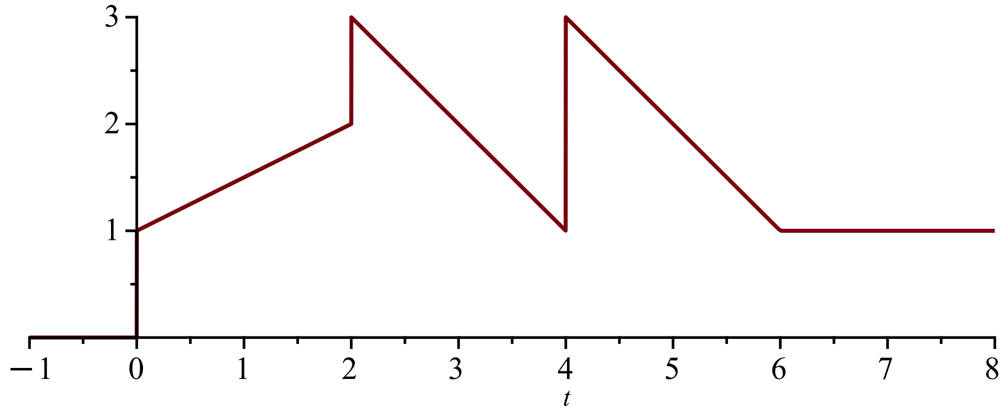
> $ComprobarDosNeg := simplify(eval(subs(z(x, y) = rhs(SolGralDosNeg), lhs(EcuaDerPar) - rhs(EcuaDerPar) = 0)))$

$$ComprobarDosNeg := 0 = 0 \tag{54}$$

> $restart$

> $with(inttrans):$

> $Grafica := \mathrm{Heaviside}(t) + \frac{t}{2} \cdot \mathrm{Heaviside}(t) + \mathrm{Heaviside}(t-2) - \frac{t-2}{2} \cdot \mathrm{Heaviside}(t-2) - (t-2) \cdot \mathrm{Heaviside}(t-2) + (t-4) \cdot \mathrm{Heaviside}(t-4) + 2 \cdot \mathrm{Heaviside}(t-4) - (t-4) \cdot \mathrm{Heaviside}(t-4) + (t-6) \cdot \mathrm{Heaviside}(t-6) : plot(Grafica, t = -1..8, scaling = CONSTRAINED)$




> *restart*

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