> restart

> $EDenDP := diff(z(x,y), y\$2) - 4\cdot diff(z(x,y), x) - z(x,y) = 0$

$$EDenDP := \frac{\partial^2}{\partial y^2} z(x,y) - 4\left(\frac{\partial}{\partial x} z(x,y)\right) - z(x,y) = 0 \quad (1)$$

> $SolGral := pdsolve(EDenDP)$

$$SolGral := (z(x,y) = \_F1(x)\ \_F2(y))\ \&where \left[\left\{\frac{d}{dx}\_F1(x) = \_c_1\,\_F1(x), \frac{d^2}{dy^2}\_F2(y) = 4\,\_c_1\,\_F2(y) + \_F2(y)\right\}\right] \quad (2)$$

> $with(PDEtools):$

> $build(\%\%)$

$$z(x,y) = \_C1\,e^{\_c_1 x}\,\_C2\sin\left(\sqrt{-4\,\_c_1 - 1}\,y\right) + \_C1\,e^{\_c_1 x}\,\_C3\cos\left(\sqrt{-4\,\_c_1 - 1}\,y\right) \quad (3)$$

> $SOLGRAL := z(x,y) = \_C1\,e^{\_c_1 x}\,\_C2\sin\left(\sqrt{-4\,\_c_1 - 1}\,y\right) + \_C1\,e^{\_c_1 x}\,\_C3\cos\left(\sqrt{-4\,\_c_1 - 1}\,y\right)$

$$SOLGRAL := z(x,y) = \_C1\,e^{\_c_1 x}\,\_C2\sin\left(\sqrt{-4\,\_c_1 - 1}\,y\right) + \_C1\,e^{\_c_1 x}\,\_C3\cos\left(\sqrt{-4\,\_c_1 - 1}\,y\right) \quad (4)$$

> $Comprobacion := simplify(eval(subs(z(x,y) = rhs(SOLGRAL), EDenDP)))$

$$Comprobacion := 0 = 0 \quad (5)$$

> $EDenDP$

$$\frac{\partial^2}{\partial y^2} z(x,y) - 4\left(\frac{\partial}{\partial x} z(x,y)\right) - z(x,y) = 0 \quad (6)$$

> $SOL := eval(subs(z(x,y) = F(x)\cdot G(y), EDenDP))$

$$SOL := F(x)\left(\frac{d^2}{dy^2} G(y)\right) - 4\left(\frac{d}{dx} F(x)\right) G(y) - F(x)\,G(y) = 0 \quad (7)$$

> $SOLdos := lhs(SOL) - \left(-4\left(\frac{d}{dx} F(x)\right) G(y) - F(x)\,G(y)\right) = rhs(SOL) - \left(-4\left(\frac{d}{dx} F(x)\right) G(y) - F(x)\,G(y)\right)$

$$SOLdos := F(x)\left(\frac{d^2}{dy^2} G(y)\right) = 4\left(\frac{d}{dx} F(x)\right) G(y) + F(x)\,G(y) \quad (8)$$

> $SOLtres := \frac{lhs(SOLdos)}{4\cdot F(x)\cdot G(y)} = simplify\left(\frac{rhs(SOLdos)}{4\cdot F(x)\cdot G(y)}\right)$

$$SOLtres := \frac{1}{4}\,\frac{\frac{d^2}{dy^2} G(y)}{G(y)} = \frac{1}{4}\,\frac{4\left(\frac{d}{dx} F(x)\right) + F(x)}{F(x)} \quad (9)$$

> $EdoXuno := rhs(SOLtres) = \text{alpha}$

$$EdoXuno := \frac{1}{4}\,\frac{4\left(\frac{d}{dx}F(x)\right)+F(x)}{F(x)} = \alpha \tag{10}$$

> $EdoYuno := lhs(SOLtres) = \text{alpha}$

$$EdoYuno := \frac{1}{4}\,\frac{\frac{d^2}{dy^2}G(y)}{G(y)} = \alpha \tag{11}$$

> $SolXunoCero := dsolve(subs(\text{alpha}=0, EdoXuno))$

$$SolXunoCero := F(x) = \_C1\, e^{-\frac{1}{4}x} \tag{12}$$

> $SolYunoCero := dsolve(subs(\text{alpha}=0, EdoYuno))$

$$SolYunoCero := G(y) = \_C1\, y + \_C2 \tag{13}$$

> $SOLunoCero := z(x,y) = rhs(SolXunoCero)\cdot rhs(SolYunoCero)$

$$SOLunoCero := z(x,y) = \_C1\, e^{-\frac{1}{4}x}\,(\_C1\, y + \_C2) \tag{14}$$

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

$$SolXunoPos := F(x) = \_C1\, e^{\frac{1}{4}(2\beta-1)(2\beta+1)x} \tag{15}$$

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

$$SolYunoPos := G(y) = \_C1\, e^{-2\beta y} + \_C2\, e^{2\beta y} \tag{16}$$

> $SolUnoPos := z(x,y) = rhs(SolXunoPos)\cdot rhs(SolYunoPos)$

$$SolUnoPos := z(x,y) = \_C1\, e^{\frac{1}{4}(2\beta-1)(2\beta+1)x}\left(\_C1\, e^{-2\beta y} + \_C2\, e^{2\beta y}\right) \tag{17}$$

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

$$SolXunoNeg := F(x) = \_C1\, e^{-\frac{1}{4}(1+4\beta^2)x} \tag{18}$$

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

$$SolYunoNeg := G(y) = \_C1\,\sin(2\beta y) + \_C2\,\cos(2\beta y) \tag{19}$$

> $SolUnoNeg := z(x,y) = rhs(SolXunoNeg)\cdot rhs(SolYunoNeg)$

$$SolUnoNeg := z(x,y) = \_C1\, e^{-\frac{1}{4}(1+4\beta^2)x}\left(\_C1\,\sin(2\beta y) + \_C2\,\cos(2\beta y)\right) \tag{20}$$

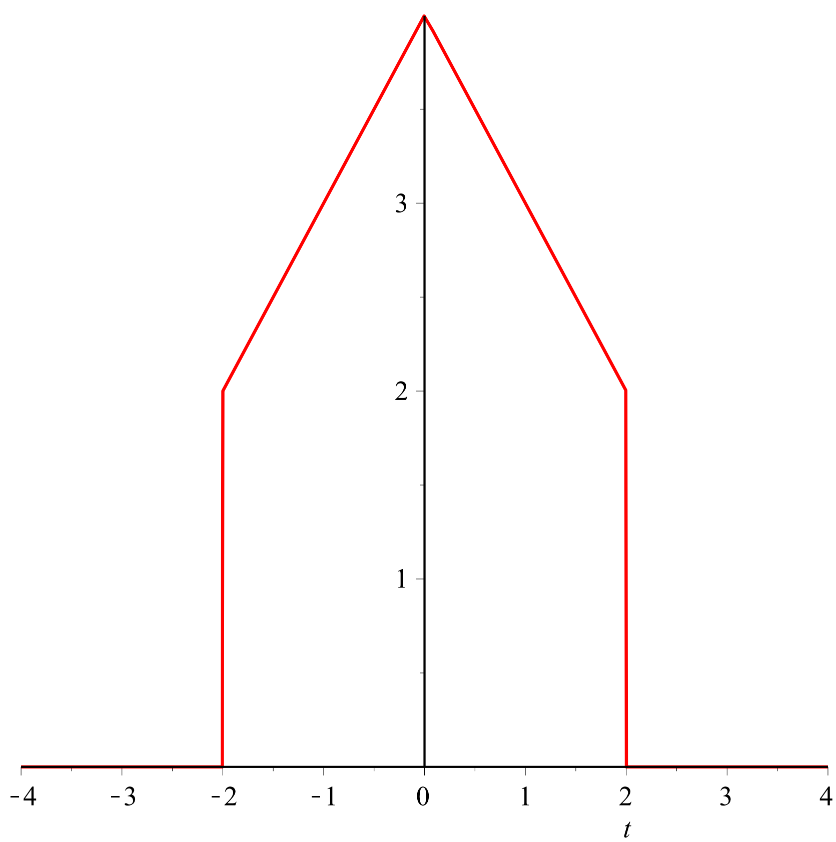
> $SOLGRAL$

$$z(x,y) = \_C1\, e^{\_c_1 x}\,\_C2\,\sin\left(\sqrt{-4\,\_c_1 - 1}\; y\right) + \_C1\, e^{\_c_1 x}\,\_C3\,\cos\left(\sqrt{-4\,\_c_1 - 1}\; y\right) \tag{21}$$

> $restart$

> $Casita := f(t) = 2\cdot\text{Heaviside}(t+2) + (t+2)\cdot\text{Heaviside}(t+2) - 2\cdot t\cdot\text{Heaviside}(t) + (t-2)\cdot\text{Heaviside}(t-2) - 2\cdot\text{Heaviside}(t-2);\, plot(rhs(Casita), t=-4..4)$

$$Casita := f(t) = 2\,\text{Heaviside}(t+2) + (t+2)\,\text{Heaviside}(t+2) - 2\,t\,\text{Heaviside}(t) + (t-2)\,\text{Heaviside}(t-2) - 2\,\text{Heaviside}(t-2)$$



> $L := 4$

$$L := 4 \tag{22}$$

> $a[0] := \frac{1}{L} \cdot int(rhs(Casita), t = -L..L)$

$$a_0 := 3 \tag{23}$$

> $a[n] := simplify\left(\frac{1}{L} \cdot int\left(rhs(Casita) \cdot \cos\left(\frac{n \cdot \mathrm{Pi} \cdot t}{L}\right), t = -L..L\right)\right)$

$$a_n := \frac{4\left(n\,\pi \sin\left(\frac{1}{2}\,n\,\pi\right) - 2\cos\left(\frac{1}{2}\,n\,\pi\right) + 2\right)}{n^2\,\pi^2} \tag{24}$$

> $b[n] := simplify\left(\frac{1}{L} \cdot int\left(rhs(Casita) \cdot \sin\left(\frac{n \cdot \mathrm{Pi} \cdot t}{L}\right), t = -L..L\right)\right)$

$$b_n := 0 \tag{25}$$

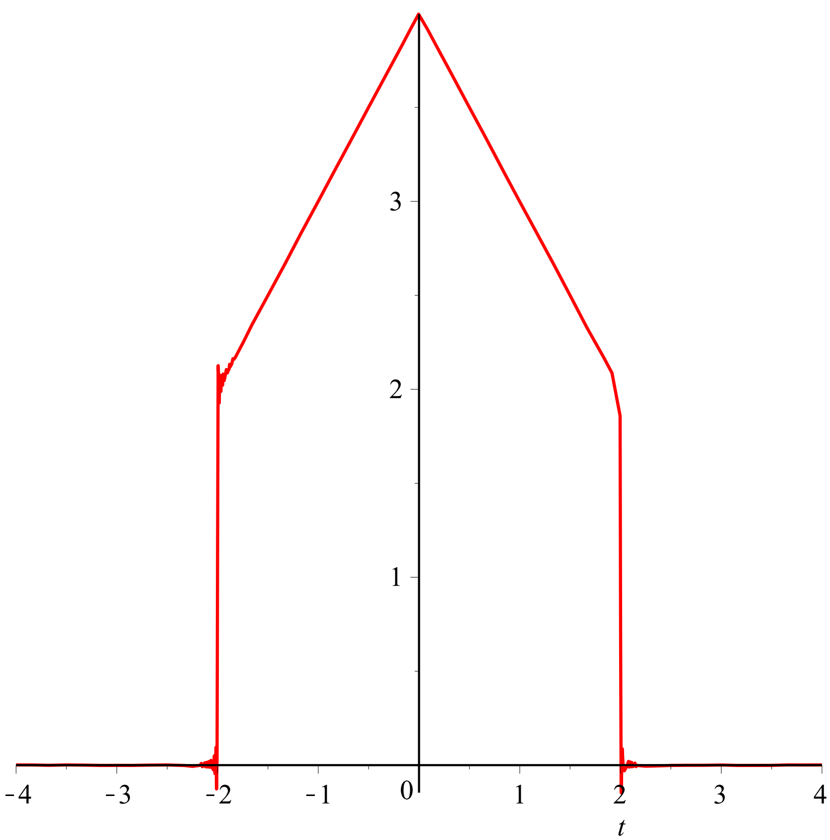
> $STF := f(t) = \frac{a[0]}{2} + Sum\left(a[n] \cdot \cos\left(\frac{n \cdot \mathrm{Pi} \cdot t}{L}\right) + b[n] \cdot \sin\left(\frac{n \cdot \mathrm{Pi} \cdot t}{L}\right), n = 1 .. infinity\right)$

(26)

$$STF := f(t) = \frac{3}{2} + \sum_{n=1}^{\infty} \frac{4\left(n\,\pi \sin\left(\frac{1}{2}\,n\,\pi\right) - 2\cos\left(\frac{1}{2}\,n\,\pi\right) + 2\right)\cos\left(\frac{1}{4}\,n\,\pi\,t\right)}{n^2\,\pi^2} \tag{26}$$

> $STF500 := f(t) = \frac{a[0]}{2} + Sum\left(a[n]\cdot\cos\left(\frac{n\cdot \mathrm{Pi}\cdot t}{L}\right) + b[n]\cdot\sin\left(\frac{n\cdot \mathrm{Pi}\cdot t}{L}\right), n = 1\,..\,500\right)$:

> $plot(rhs(STF500), t = -L..L)$



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