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> restart
1) Determine utilizando método de separación de variables
> Ecua := y·diff(u(x,y), x, y) + u(x,y) = 0
      Ecua := y ⎛  $\frac{\partial^2}{\partial x \partial y} u(x,y)$  ⎞ + u(x,y) = 0 (1)
> EcuaSeparable := eval(subs(u(x,y) = F(x)·G(y), Ecua))
      EcuaSeparable := y ⎛  $\frac{d}{dx} F(x)$  ⎞ ⎛  $\frac{d}{dy} G(y)$  ⎞ + F(x) G(y) = 0 (2)
> EcuaSepDos := lhs(EcuaSeparable) - F(x)·G(y) = rhs(EcuaSeparable) - F(x)·G(y)
      EcuaSepDos := y ⎛  $\frac{d}{dx} F(x)$  ⎞ ⎛  $\frac{d}{dy} G(y)$  ⎞ = -F(x) G(y) (3)
> EcuaSeparada :=  $\frac{lhs(EcuaSepDos)}{y \cdot diff(G(y), y) \cdot F(x)} = \frac{rhs(EcuaSepDos)}{y \cdot diff(G(y), y) \cdot F(x)}$ 
      EcuaSeparada :=  $\frac{\frac{d}{dx} F(x)}{F(x)} = -\frac{G(y)}{y \left( \frac{d}{dy} G(y) \right)}$  (4)
> EcuaX := lhs(EcuaSeparada) = β²
      EcuaX :=  $\frac{\frac{d}{dx} F(x)}{F(x)} = \beta^2$  (5)
> EcuaY := rhs(EcuaSeparada) = β²
      EcuaY :=  $-\frac{G(y)}{y \left( \frac{d}{dy} G(y) \right)} = \beta^2$  (6)
> SolX := dsolve(EcuaX)
      SolX := F(x) = c₁ eβ² x (7)
> SolY := dsolve(EcuaY)
      SolY := G(y) = c₁ y-1/β² (8)
> SolGral := u(x,y) = rhs(SolX)·subs(c₁ = 1, rhs(SolY))
      SolGral := u(x,y) = c₁ eβ² x y-1/β² (9)
> Ecua
      y ⎛  $\frac{\partial^2}{\partial x \partial y} u(x,y)$  ⎞ + u(x,y) = 0 (10)
> Comprobar := eval(subs(u(x,y) = rhs(SolGral), Ecua))
      Comprobar := 0 = 0 (11)
> restart

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6) Determina la ecuación en derivadas parciales

$$\begin{aligned} > \text{SolGral} := u(x, y) = F(x) \cdot \exp(x \cdot y) + G(x) \cdot \exp(-x \cdot y) + \frac{\exp(y)}{1 - x^2} \\ & \text{SolGral} := u(x, y) = F(x) e^{xy} + G(x) e^{-xy} + \frac{e^y}{-x^2 + 1} \end{aligned} \quad (12)$$

$$\begin{aligned} > \text{SolHom} := u(x, y) = F(x) \cdot \exp(x \cdot y) + G(x) \exp(-x \cdot y) \\ & \text{SolHom} := u(x, y) = F(x) e^{xy} + G(x) e^{-xy} \end{aligned} \quad (13)$$

$$\begin{aligned} > Q := \frac{e^y}{-x^2 + 1} \\ & Q := \frac{e^y}{-x^2 + 1} \end{aligned} \quad (14)$$

$$\begin{aligned} > \text{DerYY} := \text{diff}(\text{rhs}(\text{SolHom}), y\$2) \\ & \text{DerYY} := F(x) x^2 e^{xy} + G(x) x^2 e^{-xy} \end{aligned} \quad (15)$$

$$\begin{aligned} > \text{expand}(\text{DerYY} - x^2 \cdot \text{rhs}(\text{SolHom})) \\ & 0 \end{aligned} \quad (16)$$

$$\begin{aligned} > \text{EcuaHom} := \text{diff}(u(x, y), y\$2) - x^2 \cdot u(x, y) = 0 \\ & \text{EcuaHom} := \frac{\partial^2}{\partial y^2} u(x, y) - x^2 u(x, y) = 0 \end{aligned} \quad (17)$$

$$\begin{aligned} > \text{Comprobar} := \text{expand}(\text{eval}(\text{subs}(u(x, y) = \text{rhs}(\text{SolHom}), \text{EcuaHom}))) \\ & \text{Comprobar} := 0 = 0 \end{aligned} \quad (18)$$

$$\begin{aligned} > QQ := \text{expand}(\text{eval}(\text{subs}(u(x, y) = Q, \text{lhs}(\text{EcuaHom})))) \\ & QQ := \frac{e^y}{-x^2 + 1} - \frac{x^2 e^y}{-x^2 + 1} \end{aligned} \quad (19)$$

$$\begin{aligned} > \text{EcuaNoHom} := \text{lhs}(\text{EcuaHom}) = QQ \\ & \text{EcuaNoHom} := \frac{\partial^2}{\partial y^2} u(x, y) - x^2 u(x, y) = \frac{e^y}{-x^2 + 1} - \frac{x^2 e^y}{-x^2 + 1} \end{aligned} \quad (20)$$

$$\begin{aligned} > \text{ComprobarDos} := \text{simplify}(\text{eval}(\text{subs}(u(x, y) = \text{rhs}(\text{SolGral}), \text{EcuaNoHom}))) \\ & \text{ComprobarDos} := e^y = e^y \end{aligned} \quad (21)$$

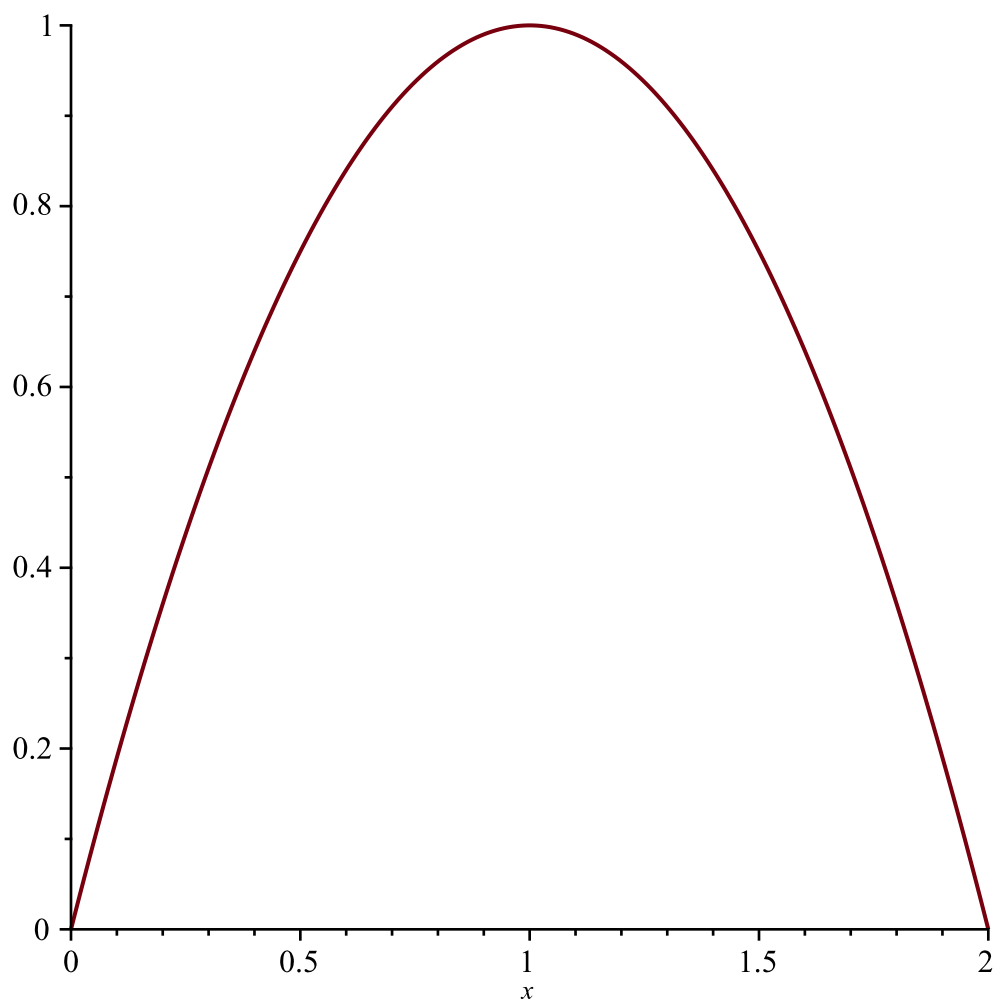
> restart

2) Desarrollo serie coseno Fourier

$$\begin{aligned} > f := x \cdot (2 - x) \\ & f := x(2 - x) \end{aligned} \quad (22)$$

$$\begin{aligned} > 0 < x < 2 \\ & 0 < x < 2 \end{aligned} \quad (23)$$

$$> \text{plot}(f, x = 0..2)$$



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> h := Heaviside(x)·x·(2 - x) + Heaviside(-x)·(-x·(2 + x))
      h := Heaviside(x) x (2 - x) - Heaviside(-x) x (2 + x)
> plot(h, x=-2..2)

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(24)

