

> restart ;  
 > Ecuacion := diff(u(x, y), x\$2) + diff(u(x, y), y) = u(x, y);

$$Ecuacion := \frac{\partial^2}{\partial x^2} u(x, y) + \frac{\partial}{\partial y} u(x, y) = u(x, y) \quad (1)$$

> with(PDEtools) :  
 > SolucionGnerallInicial := build(pdsolve(Ecuacion));

$$SolucionGnerallInicial := u(x, y) = \frac{e^{\sqrt{-c_1} x} C3 e^y C1}{e^{y-c_1}} + \frac{C3 e^y C2}{e^{\sqrt{-c_1} x} e^{y-c_1}} \quad (2)$$

> Ecuacion;

$$\frac{\partial^2}{\partial x^2} u(x, y) + \frac{\partial}{\partial y} u(x, y) = u(x, y) \quad (3)$$

> EcuacionSeparable := eval(subs(u(x, y) = F(x) · G(y), Ecuacion));

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

> EcuacionSeparada := 
$$\frac{\left( lhs(EcuacionSeparable) - F(x) \left( \frac{d}{dy} G(y) \right) \right)}{-F(x) \cdot G(y)}$$

= simplify(
$$\frac{\left( rhs(EcuacionSeparable) - F(x) \left( \frac{d}{dy} G(y) \right) \right)}{-F(x) \cdot G(y)}$$
)

$$EcuacionSeparada := - \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = - \frac{G(y) - \left( \frac{d}{dy} G(y) \right)}{G(y)} \quad (5)$$

> EcuacionX := lhs(EcuacionSeparada) = alpha; EcuacionY := rhs(EcuacionSeparada) = alpha;

$$EcuacionX := - \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \alpha$$

$$EcuacionY := - \frac{G(y) - \left( \frac{d}{dy} G(y) \right)}{G(y)} = \alpha \quad (6)$$

> EcuacionXcero := subs(alpha=0, EcuacionX); EcuacionYcero := subs(alpha=0, EcuacionY);

$$EcuacionXcero := - \frac{\frac{d^2}{dx^2} F(x)}{F(x)} = 0$$

$$EcuacionYcero := - \frac{G(y) - \left( \frac{d}{dy} G(y) \right)}{G(y)} = 0 \quad (7)$$

> SolucionXcero := dsolve(EcuacionXcero); SolucionYcero := dsolve(EcuacionYcero);

$$SolucionXcero := F(x) = \_C1 x + \_C2$$

$$\text{SolucionYcero} := G(y) = \_C1 e^y \quad (8)$$

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$$\text{SolucionGcero} := u(x, y) = \text{rhs}(\text{SolucionXcero}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionYcero}));$$

$$\text{SolucionGcero} := u(x, y) = (\_C1 x + \_C2) e^y \quad (9)$$

$$\text{EcuacionXpositiva} := \text{subs}(\alpha = \beta \cdot 2, \text{EcuacionX}); \text{EcuacionYpositiva} := \text{subs}(\alpha = \beta \cdot 2, \text{EcuacionY});$$

$$\text{EcuacionXpositiva} := -\frac{\frac{d^2}{dx^2} F(x)}{F(x)} = \beta^2$$

$$\text{EcuacionYpositiva} := -\frac{G(y) - \left(\frac{d}{dy} G(y)\right)}{G(y)} = \beta^2 \quad (10)$$

$$\text{SolucionXpositiva} := \text{dsolve}(\text{EcuacionXpositiva}); \text{SolucionYpositiva} := \text{dsolve}(\text{EcuacionYpositiva});$$

$$\text{SolucionXpositiva} := F(x) = \_C1 \sin(\beta x) + \_C2 \cos(\beta x)$$

$$\text{SolucionYpositiva} := G(y) = \_C1 e^{(1+\beta^2)y} \quad (11)$$

$$\text{SolucionGpositiva} := u(x, y) = \text{rhs}(\text{SolucionXpositiva}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionYpositiva}));$$

$$\text{SolucionGpositiva} := u(x, y) = (\_C1 \sin(\beta x) + \_C2 \cos(\beta x)) e^{(1+\beta^2)y} \quad (12)$$

$$\text{EcuacionXnegativa} := \text{subs}(\alpha = -\beta \cdot 2, \text{EcuacionX}); \text{EcuacionYnegativa} := \text{subs}(\alpha = -\beta \cdot 2, \text{EcuacionY});$$

$$\text{EcuacionXnegativa} := -\frac{\frac{d^2}{dx^2} F(x)}{F(x)} = -\beta^2$$

$$\text{EcuacionYnegativa} := -\frac{G(y) - \left(\frac{d}{dy} G(y)\right)}{G(y)} = -\beta^2 \quad (13)$$

$$\text{SolucionXnegativa} := \text{dsolve}(\text{EcuacionXnegativa}); \text{SolucionYnegativa} := \text{dsolve}(\text{EcuacionYnegativa});$$

$$\text{SolucionXnegativa} := F(x) = \_C1 e^{\beta x} + \_C2 e^{-\beta x}$$

$$\text{SolucionYnegativa} := G(y) = \_C1 e^{-(\beta-1)(\beta+1)y} \quad (14)$$

$$\text{SolucionGnegativa} := u(x, y) = \text{simplify}(\text{rhs}(\text{SolucionXnegativa}) \cdot \text{subs}(\_C1 = 1, \text{rhs}(\text{SolucionYnegativa})));$$

$$\text{SolucionGnegativa} := u(x, y) = (\_C1 e^{\beta x} + \_C2 e^{-\beta x}) e^{-(\beta-1)(\beta+1)y} \quad (15)$$

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