EDenDP. Método de Separación de Variables

1: Prueba-error

- Propone una hipótesis inicial.
- sustituye la hipótesis en la EDenDP
- Procura la separación de variables (no es única)
- Si se se consigue separar entonces tiene al menos una solución general.
- en caso de <u>no lograr</u> la separación, se propone otra Hipótesis y se vuelve al principio

SG

$f(x,y)$

$$\frac{\partial^2 f}{\partial x^2} = a^2 \frac{\partial f}{\partial y}$$ EDonDP(2)L.cc H.

MSV.

$$f(x,y) \Rightarrow F(x)\cdot G(y)$$

$$\frac{\partial f}{\partial y} = F(x)\cdot G'(y)$$

$$\frac{\partial f}{\partial x} = F'(x)\cdot G(y)$$

$$\frac{\partial^2 f}{\partial x^2} = F''(x)\cdot G(y)$$

$$F''(x)\cdot G(y) = a^2 F(x)\cdot G'(y)$$

$$\frac{F''(x)}{a^2 F(x)} = \frac{G'(y)}{G(y)}$$

$$\frac{F''(x)}{F(x)} = a^2 \frac{G'(y)}{G(y)}$$

$$\frac{F''(x)}{a^2F(x)} = \frac{G'(y)}{G(y)}$$

razones y proporciones

$$\frac{F''(x)}{a^2F(x)} = \alpha \qquad \frac{G'(y)}{G(y)} = \alpha$$

$\boxed{\alpha = 0}$

$$\frac{F''(x)}{a^2F(x)} = 0$$

$F(x) \neq 0 \quad a^2 \neq 0$

$F''(x) = 0$

$F'(x) = C_1$

$$\boxed{F(x) = C_1 x + C_2}$$

$$\frac{G'(y)}{G(y)} = 0$$

$G(y) \neq 0$

$G'(y) = 0$

$$\boxed{G(y) = k_1}$$

$$f_g(x,y) = (C_1 x + C_2)k_1$$

$$\boxed{f_g(x,y) = C_{10}x + C_{20}}$$

$\boxed{\alpha > 0}$ $\alpha = \beta^2$ $\forall \beta \neq 0 \in \mathbb{R}$

$$\frac{F''(x)}{a^2F(x)} = \beta^2$$

$F''(x) = a^2\beta^2F(x)$

$F''(x) - a^2\beta^2F(x) = 0$

EDO(2)LCCH.

$m^2 - a^2\beta^2 = 0$

$(m - a\beta)(m + a\beta) = 0$

$$\boxed{F(x) = C_1e^{a\beta x} + C_2e^{-a\beta x}}$$

$$\frac{G'(y)}{G(y)} = \beta^2$$

$G'(y) = \beta^2G(y)$

$G'(y) - \beta^2G(y) = 0$

EDO(1)LCCH.

$$\boxed{G(y) = k_1e^{\beta^2 y}}$$

$$f_g(x,y) = \left(C_1e^{a\beta x} + C_2e^{-a\beta x}\right)k_1e^{\beta^2 y}$$

$$\boxed{f_g(x,y) = C_{10}e^{(a\beta x + \beta^2 y)} + C_{20}e^{(-a\beta x + \beta^2 y)}}$$

$\boxed{\alpha < 0}$

$\alpha = -\beta^2 \quad \forall \beta \neq 0 \in \mathbb{R}$

$$\frac{F''(x)}{a^2 F(x)} = -\beta^2 \qquad\qquad \frac{G'(y)}{G(y)} = -\beta^2$$

$G'(y) = -\beta^2 G(y)$

$G'(y) + \beta^2 G(y) = 0$

EDO(1)L cc H.

$$\boxed{G(y) = k_1 e^{-\beta^2 y}}$$

$F''(x) = -a^2\beta^2 F(x)$

$F''(x) + a^2\beta^2 F(x) = 0$

EDOL(2) cc H.

$m^2 + a^2\beta^2 = 0$

$m = \pm a\beta i$

$$\boxed{F(x) = C_1 \cos(a\beta x) + C_2 \operatorname{sen}(a\beta x)}$$

$$f_g(x,y) = \left(C_1 \cos(a\beta x) + C_2 \operatorname{sen}(a\beta x)\right) k_1 e^{-\beta^2 y}$$

$$\boxed{f_g(x,y) = C_{10} e^{-\beta^2 y} \cos(a\beta x) + C_{20} e^{-\beta^2 y} \operatorname{sen}(a\beta x)}$$

$$f_g(x,y) = \underset{\alpha=0}{f(x,y)} \cup \underset{\alpha>0}{f(x,y)} \cup \underset{\alpha<0}{f(x,y)}$$

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial z}{\partial y} = z$$

$$\frac{\partial^2 z}{\partial x^2} + y^2 \frac{\partial z}{\partial y} = 0$$

$$\frac{\partial^2 z}{\partial y^2} + \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial x} = 0 \qquad z = F(x) + G(y)$$