Método Separación de Variables

- Prueba y error
- Hipótesis es correcta
- EDenDP $\Longrightarrow$ conj. EDO's

$z(x,y)$

$$\frac{\partial^2 z}{\partial x^2} - 6\frac{\partial z}{\partial y} = 0$$

MSV

$\Rightarrow H_0: \quad z(x,y) = F(x)\cdot G(y)$

$$\left\{\begin{array}{l} H_1: \ z = \frac{F}{G} \\ H_2: \ z = F + G \\ H_3: \ z = F^y \\ H_4: \ z = G^x \\ \vdots \end{array}\right.$$

$$\frac{\partial z}{\partial x} = F'(x)\cdot G(y) + \cancel{G'(y)}\cdot F(x)$$

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

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

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

$$F''(x)\cdot G(y) - 6\cdot F(x)\cdot G'(y) = 0$$

$$F''(x)\cdot G(y) = 6\cdot F(x)\cdot G'(y)$$

$$\frac{F''(x)\cdot \cancel{G(y)}}{F(x)\cdot \cancel{G(y)}} = 6\cdot\frac{\cancel{F(x)}\cdot G'(y)}{\cancel{F(x)}\cdot G(y)}$$

$$\frac{F''(x)}{F(x)} = 6\,\frac{G'(y)}{G(y)} \quad \text{ok}$$

$$\frac{F''(x)}{F(x)} = \alpha \qquad 6\frac{G'(y)}{G(y)} = \alpha$$

$$\frac{F''(x)}{F(x)} = \alpha \qquad 6 \quad \frac{G'(y)}{G(y)} = \alpha$$

para $\alpha = 0$ $\quad F(x) \neq 0 \qquad G \quad \frac{G'(y)}{G(y)} = 0 \quad G(y) \neq 0$

$$F''(x) = 0 \qquad G'(y) = 0$$

$$F'(x) = k_1 \qquad \boxed{G(y) = C_1} \quad G \neq 0$$

$$\boxed{F(x) = k_1 x + k_2}$$

(9)

$$Z_{\alpha=0}(x,y) = (k_1 x + k_2)\, C_1$$

$$\frac{F''(x)}{F(x)} = \alpha \qquad 6\frac{G'(y)}{G(y)} = \alpha$$

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

$$\frac{F''(x)}{F(x)} = \beta^2 \qquad 6\frac{G'(y)}{G(y)} = \beta^2$$

$$F''(x) = \beta^2 F(x) \qquad G'(y) = \frac{\beta^2}{6} G(y)$$

$$F''(x) - \beta^2 F(x) = 0 \qquad G'(y) - \frac{\beta^2}{6} G(y) = 0$$

$$\frac{d^2F}{dx^2} - \beta^2 F = 0 \qquad \frac{dG}{dy} - \frac{\beta^2}{6} G = 0$$

EDO (2) L cc H. $\qquad$ EDO (1) L cc H

$$\boxed{G(y) = C_1 e^{+\frac{\beta^2}{6}y}}$$

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

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

$$m_1 = -\beta \quad m_2 = \beta$$

$$\boxed{F(x) = k_1 e^{-\beta x} + k_2 e^{\beta x}}$$

$$Z^{9}_{\alpha>0}(x,y) = \left(k_1 e^{-\beta x} + k_2 e^{\beta x}\right)\left(C_1 e^{+\frac{\beta^2}{6}y}\right)$$

$$\frac{F''(x)}{F(x)} = \alpha \qquad 6\,\frac{G'(y)}{G(y)} = \alpha$$

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

$$\frac{F''(x)}{F(x)} = -\beta^2 \qquad 6\,\frac{G'(y)}{G(y)} = -\beta^2$$

$$F''(x) = -\beta^2 F(x) \qquad G'(y) = -\frac{\beta^2}{6} G(y)$$

$$F''(x) + \beta^2 F(x) = 0 \qquad G'(y) + \frac{\beta^2}{6} G(y) = 0$$

$$m^2 + \beta^2 = 0 \quad \begin{cases} m_1 = \beta i \\ m_2 = -\beta i \end{cases} \qquad \boxed{G(y) = C_1 e^{-\frac{\beta^2}{6} y}}$$

$$\boxed{F(x) = k_1 \cos(\beta x) + k_2 \operatorname{sen}(\beta x)}$$

$$\boxed{Z_{\alpha<0}^{(9)}(x,y) = \left(k_1 \cos(\beta x) + k_2 \operatorname{sen}(\beta x)\right) C_1 e^{-\frac{\beta^2}{6} y}}$$