CAPÍTULO IV.- Método de Separación de Variables

1- Método de prueba y error

2- Tiene diversas soluciones todas válidas

$$\frac{\partial^2 z(x,y)}{\partial x^2} + 5\frac{\partial z(x,y)}{\partial y} = z(x,y)$$

$$H_0 = z(x,y) = P(x)\cdot Q(y)$$

$$\frac{\partial z}{\partial x} = P'(x)\cdot Q(y) + P(x)\cdot \frac{d}{dx}Q(y)$$ (0)

$$\frac{\partial z}{\partial x} = P'(x)\cdot Q(y) \qquad \frac{\partial z}{\partial y} = P(x)\cdot Q'(y)$$

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

$$P''(x)\cdot Q(y) + 5P(x)\cdot Q'(y) = P(x)\cdot Q(y)$$

$$P''(x)\cdot Q(y) - P(x)\cdot Q(y) = -5P(x)\cdot Q'(y)$$

$$\left(P''(x) - P(x)\right)Q(y) = -5P(x)\left(Q'(y)\right)$$

$$\Longrightarrow \frac{P''(x) - P(x)}{-5P(x)} = \frac{Q'(y)}{Q(y)}$$

$$P''(x)Q(y) = P(x)Q(y) - 5P(x)Q'(y)$$

$$\Longrightarrow \frac{P''(x)}{P(x)} = \frac{-5Q'(y) + Q(y)}{Q(y)}$$

$H_0 \quad z(x,y) = P(x) \cdot Q(y)$

$H_1 \quad z(x,y) = \frac{P(x)}{Q(y)}$

$H_2 \quad z(x,y) = \frac{Q(y)}{P(x)}$

$H_3 \quad z(x,y) = Q(y) \log(x)$

$H_4 \quad z(x,y) = P(x) \log(y)$

$H_5 \quad z(x,y) = P(x)^y$

$H_6 \quad z(x,y) = Q(y)^x$

$H_7 \quad z(x,y) = P(x) + Q(y)$

$$\frac{-\frac{d^2P(x)}{dx^2}+P(x)}{5P(x)}=\frac{\frac{dQ(y)}{dy}}{Q(y)}$$

$$\frac{-\frac{d^2P(x)}{dx^2}+P(x)}{5P(x)}=\alpha \qquad \frac{\frac{dQ(y)}{dy}}{Q(y)}=\alpha$$

$\alpha=0$

$$\frac{-\frac{d^2P(x)}{dx^2}+P(x)}{5P(x)}=0$$

$$-\frac{d^2P(x)}{dx^2}+P(x)=0$$

$$\frac{d^2P(x)}{dx^2}-P(x)=0$$

$$(D^2-1)P(x)=0$$

$$m^2-1=0$$

$$(m-1)(m+1)=0$$

$$m_1=1 \quad m_2=-1$$

$$P(x)=C_1e^{x}+C_2e^{-x}$$

$$\frac{\frac{dQ(y)}{dy}}{Q(y)}=0$$

$$\frac{dQ(y)}{dy}=0$$

$$Q(y)=k_1$$

$$Z(x,y)_{\alpha=0}=\left(C_1e^{x}+C_2e^{-x}\right)k_1$$

$$Z(x,y)=C_{10}e^{x}+C_{20}e^{-x}$$