Método de Separación de Variables para resolver EDenDP.

(método de prueba y error).

$$\frac{\partial^2 F}{\partial x^2} + 3\frac{\partial F}{\partial y} = 5F \qquad F(x,y)$$

H_0: $F(x,y) = f(x)\cdot g(y)$

H_1: $F(x,y) = f(x) + g(y)$

H_i: $F(x,y) = (f(x))^y$

H_{i+1}: $F(x,y) = g(y)^x$ etc

$$\frac{\partial^2 F}{\partial x^2} + 3\frac{\partial F}{\partial y} = 5F \qquad H_0: F(x,y) = f(x)\cdot g(y)$$

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

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

$$f''(x)\cdot g(y) + 3\cdot f(x)\cdot g'(y) = 5f(x)\cdot g(y)$$

$$f''(x)\cdot g(y) = -3\cdot f(x)\cdot g'(y) + 5f(x)\cdot g(y)$$

$$= f(x)\left[-3g'(y) + 5g(y)\right]$$

$$\boxed{\frac{f''(x)}{f(x)} = \frac{-3g'(y) + 5g(y)}{g(y)}}$$

$$f''(x)\cdot g(y) - 5f(x)\cdot g(y) = -3f(x)\cdot g'(y)$$

$$\left[f''(x) - 5f(x)\right]g(y) = -3f(x)\cdot g'(y)$$

$$\boxed{\frac{f''(x) - 5f(x)}{f(x)} = -3\frac{g'(y)}{g(y)}}$$

$$\frac{f''(x)}{f(x)} = \frac{-3g'(y)+5g(y)}{g(y)}$$ razones y proporciones

$$\frac{f''(x)}{f(x)} = \alpha \qquad \frac{-3g'(y)+5g(y)}{g(y)} = \alpha$$

$$\boxed{\alpha = 0} \qquad \alpha < 0 \qquad \alpha > 0$$

$$\frac{f''(x)}{f(x)} = 0 \rightarrow f''(x) = 0 \rightarrow f'(x) = k_1 \rightarrow \boxed{f(x) = k_1 x + k_2}$$

$f(x) \neq 0$

$$\frac{-3g'(y)+5g(y)}{g(y)} = 0 \rightarrow -3g'(y)+5g(y) = 0$$

$g(y) \neq 0$

$$g'(y) - \frac{5}{3}g(y) = 0$$

EDO(1)L cc H.

$$m - \frac{5}{3} = 0 \quad m = \frac{5}{3}$$

$$\boxed{g(y) = c_1 e^{\frac{5}{3}y}}$$

$$F(x,y) = (k_1 x + k_2) c_1 e^{\frac{5}{3}y}$$

$$\boxed{F_{g/\alpha=0}(x,y) = C_{10} x e^{\frac{5}{3}y} + C_{20} e^{\frac{5}{3}y}}$$

SOLUCIONES GENERALES

$$\boxed{F_g = F_{\alpha=0} \cup F_{\alpha<0} \cup F_{\alpha>0}}$$

$$\frac{\partial F}{\partial x} = C_{10} e^{\frac{5}{3}y} \rightarrow \frac{\partial^2 F}{\partial x^2} = 0$$

$$\frac{\partial F}{\partial y} = C_{10} x \cdot \frac{5}{3} e^{\frac{5}{3}y} + C_{20} \cdot \frac{5}{3} e^{\frac{5}{3}y}$$

$$[0] + 3\left[\frac{5}{3} C_{10} x e^{\frac{5}{3}y} + \frac{5}{3} C_{20} e^{\frac{5}{3}y}\right] = 5\left[C_{10} x e^{\frac{5}{3}y} + C_{20} e^{\frac{5}{3}y}\right]$$

$$5C_{10} x e^{\frac{5}{3}y} + 5C_{20} e^{\frac{5}{3}y} = 5C_{10} x e^{\frac{5}{3}y} + 5C_{20} e^{\frac{5}{3}y}$$

$$0 \equiv 0$$

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

$$\frac{f''(x)}{f(x)} = -\beta^2 \qquad f''(x) + \beta^2 f(x) = 0$$

EDO(2) L cc H.

$m^2 + \beta^2 = 0 \qquad m_1 = \beta i$

$m_2 = -\beta i$

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

$$\frac{-3g'(y) + 5g(y)}{g(y)} = -\beta^2$$

$$-3g'(y) + 5g(y) = -\beta^2 g(y)$$

$$g'(y) - \frac{(5+\beta^2)}{3} g(y) = 0 \qquad \boxed{g(y) = C_1 e^{\frac{5+\beta^2}{3} y}}$$

EDO(1) L cc H.

$$F(x,y)_{/\alpha<0} = \left[k_1 \cos(\beta x) + k_2 \operatorname{sen}(\beta x)\right] C_1 e^{\frac{5+\beta^2}{3} y}$$

$$\boxed{F(x,y)_{\alpha<0} = C_{10} e^{\frac{5+\beta^2}{3} y} \cos(\beta x) + C_{20} e^{\frac{5+\beta^2}{3} y} \operatorname{sen}(\beta x)}$$

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

$$\frac{f''(x)}{f(x)} = \beta^2 \rightarrow f''(x) = \beta^2 f(x) \Rightarrow f''(x) - \beta^2 f(x) = 0$$

EDO(2) L cc H.

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

$(m-\beta)(m+\beta) = 0 \quad m_1 = \beta \quad m_2 = -\beta$

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

$$\frac{-3g'(y) + 5g(y)}{g(y)} = \beta^2 \rightarrow -3g'(y) + 5g(y) = \beta^2 g(y)$$

$$g'(y) - \frac{5-\beta^2}{3} g(y) = 0 \qquad \boxed{g(y) = C_1 e^{\frac{5-\beta^2}{3} y}}$$

EDO(1) L cc H.

$$\underset{\alpha>0}{F(x,y)} = \left(k_1 e^{\beta x} + k_2 e^{-\beta x}\right) C_1 e^{\frac{5-\beta^2}{3} y}$$

$$\boxed{\underset{\alpha>0}{F(x,y)} = C_{10} e^{\left(\beta x + \frac{5-\beta^2}{3} y\right)} + C_{20} e^{\left(-\beta x + \frac{5-\beta^2}{3} y\right)}}$$

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