Método de Parámetros Variables.

$$\frac{dy}{dx} + p(x)y = 0 \qquad y_g = c_1 e^{-\int p(x)dx}$$

$$\frac{dy}{dx} + p(x)y = q(x) \qquad y_g = c_1 e^{-\int p(x)dx} + e^{-\int p(x)dx}\int e^{\int p(x)dx} q(x)dx.$$

$$y_{g/h} = c_1 e^{-\int p(x)dx}$$

$$y_{g/n-h} = \left[\underbrace{c_1 + \int e^{\int p(x)dx} q(x)dx}_{}\right] e^{-\int p(x)dx}$$

$$y_{g/n-h} = A(x) e^{-\int p(x)dx}$$

$$y_{g/h} = c_1 e^{-\int p(x)dx}$$

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = Q(x)$$

$$y_{g/h} = C_1 y_1 + C_2 y_2$$

$$y_{g/n-h} = A(x)\, y_1 + B(x)\, y_2$$

$$\frac{dy}{dx} = A(x) \cdot y_1' + B(x)\, y_2' + \overset{=0}{\boxed{A'(x) y_1 + B'(x) y_2}}$$

$$\frac{dy}{dx} = A(x)\, y_1' + B(x)\, y_2' + (0)$$

$$\frac{d^2y}{dx^2} = A(x)\, y_1'' + B(x)\, y_2'' + \overset{=Q(x)}{\boxed{A'(x) y_1' + B'(x) y_2'}}$$

$$\frac{d^2y}{dx^2} = A(x)\, y_1'' + B(x)\, y_2'' + Q(x)$$

$$\frac{d^2y}{dx^2} + a_1 \frac{dy}{dx} + a_2 y = Q(x)$$

$$\left[A(y)\, y_1'' + B(x)\, y_2'' + Q(x)\right] + a_1 \left[A(x)\, y_1' + B(x)\, y_2'\right] + a_2 \left[A(x)\, y_1 + B(x)\, y_2\right] = Q(x)$$

$$y''' - y'' + y' - y = x^2 + x$$

$$y_{g/h} = C_1 e^{x} + C_2 \cos(x) + C_3 \operatorname{sen}(x)$$

$$y_{g/n-h} = A(x) e^{x} + B(x) \cos(x) + D(x) \operatorname{sen}(x)$$

$$y' = A(x) e^{x} - B(x) \operatorname{sen}(x) + D(x) \cos(x)$$

$$y'' = A(x) e^{x} - B(x) \cos(x) - D(x) \operatorname{sen}(x)$$

$$y''' = A(x) e^{x} + B(x) \operatorname{sen}(x) - D(x) \cos(x) + x^2 + x$$

$$\boxed{\begin{aligned} A'(x) e^{x} + B'(x) \cos(x) + D'(x) \operatorname{sen}(x) &= 0 \\ A'(x) e^{x} - B'(x) \operatorname{sen}(x) + D'(x) \cos(x) &= 0 \\ A'(x) e^{x} - B'(x) \cos(x) - D'(x) \operatorname{sen}(x) &= x^2 + x \end{aligned}}$$

$$\underbrace{\begin{bmatrix} e^{x} & \cos(x) & \operatorname{sen}(x) \\ e^{x} & -\operatorname{sen}(x) & \cos(x) \\ e^{x} & -\cos(x) & -\operatorname{sen}(x) \end{bmatrix}}_{WW} \begin{bmatrix} A'(x) \\ B'(x) \\ D'(x) \end{bmatrix} = \underbrace{\begin{bmatrix} 0 \\ 0 \\ x^2 + x \end{bmatrix}}_{QQ}$$

$$y'' - 6y' + 9y = 25e^{x}\operatorname{sen}(x)$$

$$y'' - 6y' + 9y = 0$$

$$m^2 - 6m + 9 = 0$$

$$(m-3)^2 = 0$$

$$y_1 = e^{3x} \quad y_2 = xe^{3x}$$

$$\underbrace{\begin{bmatrix} e^{3x} & xe^{3x} \\ 3e^{3x} & 3xe^{3x} + e^{3x} \end{bmatrix}}_{W} \times \begin{bmatrix} A'(x) \\ B'(x) \end{bmatrix} = \underbrace{\begin{bmatrix} 0 \\ 25e^{x}\operatorname{sen}(x) \end{bmatrix}}_{BB}$$

$$e^{3x}A'(x) + xe^{3x}B'(x) = 0$$

$$3e^{3x}A'(x) + (3xe^{3x} + e^{3x})B'(x) = 25e^{x}\operatorname{sen}(x)$$

$$-3e^{3x}A'(x) - 3xe^{3x}B'(x) = -75e^{x}\operatorname{sen}(y)$$

$$(0)A'(x) \quad (0) + e^{3x}B'(x) = -75e^{x}\operatorname{sen}(x)$$