

$$\textcircled{1} \quad y'' + 3y' + 2y = 2e^t$$

I-Homogêneo: $y'' + 3y' + 2y = 0$

$$a = 1 \quad b = 3 \quad c = 2$$

$$\Delta = 9 - 8 \therefore \Delta = 1$$

$$R = \frac{-3 \pm 1}{2(1)} \therefore R_1 = -1 \text{ e } R_2 = -2$$

$$Y_c(t) = C_1 e^t + C_2 e^{-2t}$$

II- Particular

$$\left. \begin{array}{l} Y_p(t) = Ce^t \\ Y_p'(t) = Ce^t \\ Y_p''(t) = Ce^t \end{array} \right\} \begin{aligned} (Ce^t) + 3(Ce^t) + 2(Ce^t) &= 2e^t \therefore 6Ce^t = 2e^t \therefore C = \frac{1}{3} \\ \Rightarrow Y_p(t) &= \frac{1}{3}e^t \end{aligned}$$

III- Solução Geral

$$\boxed{\begin{aligned} Y(t) &= Y_c(t) + Y_p(t) \\ Y(t) &= Ce^t + C_2 e^{-2t} + \frac{1}{3}e^t \end{aligned}}$$

Lista 4 - EDO - Resposta 2

$$12) y'' - 2y' - 3y = t^2 + 1$$

I - Homogênea

$$y'' - 2y' - 3y = 0 \quad \therefore a=1 \ b=-2 \ c=-3 \quad \therefore \Delta = 16 \quad \therefore \sqrt{\Delta} = 4 \quad \therefore R = \frac{a \pm \sqrt{\Delta}}{2a}$$

$$R_1 = 3 \quad R_2 = -1 \quad \therefore \boxed{y_c(t) = C_1 e^{3t} + C_2 e^{-t}}$$

II - Particular

Procurar Dx^2 , a particular de $Ax^2 + Bx + C$

$$\begin{cases} y_p(t) = At^2 + Bt + C \\ y_p'(t) = 2At + B \\ y_p''(t) = 2A \end{cases} \quad \begin{cases} (2A) - 2(2At + B) - 3(At^2 + Bt + C) = t^2 + 1 \\ (2A) + (-4At - 2B) + (-3At^2 - 3Bt - 3C) = t^2 + 1 \end{cases}$$

$$\Rightarrow -3At^2 = t^2 \quad \therefore -3A = 1 \quad \therefore \boxed{A = -\frac{1}{3}}$$

$$\Rightarrow -4At - 3Bt = 0t \quad \therefore -4 \cdot \left(-\frac{1}{3}\right) - 3B = 0 \quad \Rightarrow \frac{4}{3} = 3B \quad \therefore \boxed{B = \frac{4}{9}}$$

$$\begin{aligned} & \Rightarrow 2A - 2B - 3C = 1, \quad \therefore 2\left(-\frac{1}{3}\right) - 2\left(\frac{4}{9}\right) - 3C = 1 \quad \therefore -\frac{2}{3} - \frac{8}{9} - 3C = 1 \\ & \Rightarrow \cancel{\times(9)} \quad \therefore \cancel{-6} - \cancel{8} - \cancel{27C} = 1 \Rightarrow -\frac{14 - 27C}{9} = 1 \quad \therefore -14 - 27C = 9 \\ & \therefore -27C = 23 \quad \therefore \boxed{C = -\frac{23}{27}} \end{aligned}$$

$$\boxed{y_p(t) = -\frac{1}{3}t^2 + \frac{4}{9}t - \frac{23}{27}}$$

III - Solução Geral

$$y(t) = y_c(t) + y_p(t) \quad \therefore \boxed{y(t) = C_1 e^{3t} + C_2 e^{-t} - \frac{1}{3}t^2 + \frac{4}{9}t - \frac{23}{27}}$$

Linha 2 - EDO - Resposta 3

$$(3) y'' + 5y' + 6y = 3\cos(t)$$

I - Homogênea

$$y'' + 5y' + 6y = 0 \therefore a=1 b=5 c=6 \therefore D=1 \therefore \sqrt{D} = 1 \therefore R = \frac{-5 \pm 1}{2(1)}$$

$$R_1 = -2 \quad R_2 = -3 \quad \therefore Y_h(t) = C_1 e^{-2t} + C_2 e^{-3t}$$

II - Particular

$$Y_p(t) = A \sin(t) + B \cos(t)$$

$$Y_p'(t) = A \cos(t) - B \sin(t)$$

$$Y_p''(t) = -A \sin(t) - B \cos(t)$$

$$\therefore -A \sin(t) - B \cos(t) + 5A \cos(t) - 5B \sin(t) + 6A \sin(t) + 6B \cos(t) = 3 \cos(t)$$

$$-A \sin(t) - 5B \sin(t) + 6A \sin(t) = 0 \sin(t) \therefore 5A \sin(t) - 5B \sin(t) = 0 \sin(t)$$

$$5A - 5B = 0 \Rightarrow A = B$$

$$-B \cos(t) + 5A \cos(t) + 6B \cos(t) = 3 \cos(t) \therefore 5A \cos(t) + 5B \cos(t) = 3 \cos(t)$$

$$10A = 3 \therefore A = \frac{3}{10}, B = \frac{3}{10}$$

$$Y_p(t) = \frac{3}{10} \sin(t) + \frac{3}{10} \cos(t)$$

III - Solução geral

$$Y(t) = C_1 e^{-2t} + C_2 e^{-3t} + \frac{3}{10} \sin(t) + \frac{3}{10} \cos(t)$$

$$\textcircled{1} \quad Y'' - 4Y' + 4Y = 4e^t$$

I - Homogênea

$$Y'' - 4Y' + 4Y = 0 \quad \therefore a=1 \quad b=-4 \quad c=4 \quad \therefore \Delta=0 \quad \therefore R = \frac{4 \pm 0}{2(1)} \quad \therefore \boxed{R_1=2} \quad \boxed{R_2=2}$$

$$\boxed{Y_c(t) = C_1 e^{2t} + C_2 t e^{2t}}$$

II - Particular

$$\begin{aligned} Y_p(t) &= C e^t \\ Y_p'(t) &= C e^t \\ Y_p''(t) &= C e^t \end{aligned} \quad (C e^t) - 4(C e^t) + 4(C e^t) = 4e^t \quad \therefore C = 4 \quad \therefore \boxed{Y_p(t) = 4e^t}$$

III - Solução geral

$$Y(t) = Y_c(t) + Y_p(t) \quad \therefore \boxed{Y(t) = C_1 e^{2t} + C_2 t e^{2t} + 4e^t}$$

$$\textcircled{5} \quad Y'' + 2Y' + Y = \sin(t)$$

I - Homogênea

$$Y'' + 2Y' + Y = 0 \quad \therefore a=1 \quad b=2 \quad c=1 \quad \therefore \Delta=0 \quad \therefore R = \frac{-2 \pm 0}{2(1)} \quad \therefore \boxed{R_1=-1} \quad \boxed{R_2=-1}$$

$$\boxed{Y_c(t) = C_1 e^{-t} + C_2 t e^{-t}}$$

II - Particular

$$\begin{aligned} Y_p(t) &= D \sin(t) + E \cos(t) \\ Y_p'(t) &= D \cos(t) - E \sin(t) \\ Y_p''(t) &= -D \sin(t) - E \cos(t) \end{aligned} \quad \begin{aligned} (-D \sin(t) - E \cos(t)) + (2D \cos(t) - 2E \sin(t)) + (D \sin(t) + E \cos(t)) &= \sin(t) \\ -E \cos(t) + 2D \cos(t) + E \cos(t) &= 0 \cos(t) \quad \therefore 2D = 0 \quad \therefore \boxed{D=0} \end{aligned}$$

$$\therefore -(\cancel{0}) \sin(t) - 2E \sin(t) + (\cancel{0}) \sin(t) = \sin(t) \quad \therefore -2E = 1 \quad \therefore \boxed{E = -\frac{1}{2}}$$

$$\text{III - Solução Geral: } \boxed{Y(x) = C_1 e^{-t} + C_2 t e^{-t} - \frac{1}{2} \cos(t)}$$

$$⑥ y'' - 3y' + 2y = 5 \sin(t)$$

I- Homogéneo

$$y'' - 3y' + 2y = 0 \quad \therefore a=1, b=-3, c=2 \quad \therefore D=1 \quad \therefore \sqrt{D}=1 \quad \therefore R = \frac{3 \pm 1}{2(1)} \quad \therefore \boxed{R_1=2} \quad \boxed{R_2=1}$$

$$\boxed{Y_c(t) = C_1 e^{2t} + C_2 e^t}$$

II- Particular

$$\begin{aligned} Y_p(t) &= D \sin(t) + E \cos(t) \\ Y_p'(t) &= D \cos(t) - E \sin(t) \\ Y_p''(t) &= -D \sin(t) - E \cos(t) \end{aligned} \quad \left. \begin{array}{l} -D \sin(t) - E \cos(t) - 3D \cos(t) + 3E \sin(t) + 2D \sin(t) + 2E \cos(t) = 5 \sin(t) \\ D \sin(t) + E \cos(t) - 3D \cos(t) + 3E \sin(t) = 5 \sin(t) \\ E \cos(t) - 3D \cos(t) = 0 \cos(t) \quad \therefore E - 3D = 0 \quad \therefore \boxed{E = 3D} \end{array} \right\}$$

$$\therefore D \sin(t) + 3E \sin(t) = 5 \sin(t) \quad \therefore D \sin(t) + 3(3D) \sin(t) = 5 \sin(t) \quad \therefore 10D = 5 \quad \therefore \boxed{D = \frac{1}{2}}$$

$$E = 3\left(\frac{1}{2}\right) \quad \therefore \boxed{E = \frac{3}{2}}$$

III- Solución General

$$\boxed{Y(x) = C_1 e^{2t} + C_2 e^t + \frac{1}{2} \sin(t) + \frac{3}{2} \cos(t)}$$

Livro 9 - EDO - Resposta 6

$$⑦ y'' + 4y' + 4y = 2e^t + \cos(t)$$

I - Homogênea

$$\Delta = 16 - 16 = 0 \therefore R = -\frac{4}{2(1)} \therefore R_1 = -2 \quad R_2 = -2 \therefore Y_c(t) = C_1 e^{-2t} + C_2 t e^{-2t}$$

II - Particular

$$ce^t \rightarrow ce^t$$

$$\cos(t) \rightarrow D \sin(t) + E \cos(t)$$

$$\begin{aligned} Y_p(t) &= ce^t + D \sin(t) + E \cos(t) \\ Y_p'(t) &= ce^t + D \cos(t) - E \sin(t) \\ Y_p''(t) &= ce^t - D \sin(t) - E \cos(t) \end{aligned} \quad \left. \begin{array}{l} (ce^t - D \sin(t) - E \cos(t)) + (4ce^t + 4D \cos(t) - 4E \sin(t)) + (4ce^t + 4D \sin(t) + 4E \cos(t)) \\ 9ce^t = 2e^t \therefore C = \frac{2}{9} \end{array} \right\}$$

$$\Rightarrow -D \sin(t) - 4E \sin(t) + 4D \sin(t) = 0 \sin(t) \therefore -D - 4E + 4D = 0 \therefore -4E + 3D = 0 \therefore 3D = 4E \therefore D = \frac{4E}{3}$$

$$\Rightarrow -E \cos(t) + 4D \cos(t) + 4E \cos(t) = \cos(t) \therefore 4D + 3E = 1 \therefore 4\left(\frac{4E}{3}\right) + 3E = 1 \therefore \frac{16E}{3} + 3E = 1$$

$$\Rightarrow x(3) \therefore 16E + 9E = 3 \therefore 25E = 3 \therefore E = \frac{3}{25} \quad D = \frac{4}{3} \left(\frac{3}{25}\right) \therefore D = \frac{4}{25}$$

III - Solução Geral

$$Y(x) = C_1 e^{-2t} + C_2 t e^{-2t} + \frac{2}{9} e^t + \frac{4}{25} \sin(t) + \frac{3}{25} \cos(t)$$

Lista 9 - EDO - Resposta

$$⑧ y'' - 2y' + y = t^2 + 3t + 1$$

I - Homogênea

$$\Delta = 4 - 4 = 0 \therefore R = \frac{2}{2(1)} \therefore \boxed{R_1 = 1} \quad \boxed{R_2 = 1} \therefore \boxed{Y_c(t) = C_1 e^t + C_2 t e^t}$$

II - Particular

$$Y_p = At^2 + Bt + C \quad (2A) + (-4At - 2B) + (At^2 + Bt + C) = t^2 + 3t + 1$$

$$y'_p = 2At + B$$

$$y''_p = 2A$$

$$At^2 = t^2 \therefore \boxed{A = 1}$$

$$-4At + Bt = 3t \therefore -4A + B = 3 \therefore -4 + B = 3 \therefore \boxed{B = 7}$$

$$\therefore 2A - 2B + C = 1 \therefore 2 - 14 + C = 1 \therefore \boxed{C = 13}$$

III - Solução geral

$$\boxed{Y(x) = C_1 e^t + C_2 t e^t + t^2 + 7t + 13}$$

Raxumho

$$⑨ Y'' + 3Y' + 2Y = e^{-t} \sin(t)$$

$$a=1 \quad b=3 \quad c=2$$

$$\Delta = 1$$

$$R = \frac{-3+1}{2(1)}$$

$$R_1 = -1 \quad R_2 = -2$$

$$Y_p(t) = B e^{-t} \sin(t) + C e^{-t} \cos(t)$$

$$Y_p'(t) = (-e^{-t} \sin(t) + e^{-t} \cos(t))B + C(-e^{-t} \cos(t) - e^{-t} \sin(t))$$

$$Y_p''(t) = -B e^{-t} \sin(t) + B e^{-t} \cos(t) - C e^{-t} \cos(t) - C e^{-t} \sin(t)$$

$$Y_p''(t) = -B(-e^{-t} \sin(t) + e^{-t} \cos(t)) + B(-e^{-t} \cos(t) - e^{-t} \sin(t)) - C(-e^{-t} \cos(t) - e^{-t} \sin(t)) - C(-e^{-t} \sin(t) + e^{-t} \cos(t))$$

$$Y_p''(t) = B e^{-t} \sin(t) - B e^{-t} \cos(t) - B e^{-t} \cos(t) - B e^{-t} \sin(t) + C e^{-t} \cos(t) + C e^{-t} \sin(t) + C e^{-t} \sin(t) - C e^{-t} \cos(t)$$

$$Y_p''(t) = -2B e^{-t} \cos(t) + 2C e^{-t} \sin(t)$$

$$3Y_p(t) = -3B e^{-t} \sin(t) + 3B e^{-t} \cos(t) - 3C e^{-t} \cos(t) - 3C e^{-t} \sin(t)$$

$$2Y_p(t) = B e^{-t} \sin(t) + C e^{-t} \cos(t)$$

$$= -2B e^{-t} \cos(t) + 2C e^{-t} \sin(t) - 3B e^{-t} \sin(t) + 3B e^{-t} \cos(t) - 3C e^{-t} \cos(t) - 3C e^{-t} \sin(t) + B e^{-t} \sin(t) + C e^{-t} \cos(t)$$

$$\Rightarrow B e^{-t} \cos(t) - C e^{-t} \sin(t) - 2B e^{-t} \sin(t) - 2C e^{-t} \cos(t) = e^{-t} \sin(t)$$

$$\Rightarrow [C \cos(t)(B e^{-t} - 2C e^{-t})] + [\sin(t)(-C e^{-t} - 2B e^{-t})] = e^{-t} \sin(t) + (0) \cos(t)$$

$$\bullet B e^{-t} - 2C e^{-t} = 0 \therefore B e^{-t} = 2C e^{-t} \therefore B = 2C$$

$$\bullet -C e^{-t} - 2B e^{-t} = e^{-t} \therefore e^{-t}(-C - 2B) = e^{-t} \therefore -C - 2B = 1 \therefore -C - 4C = 1 \therefore C = -\frac{1}{5}$$

$$\Rightarrow B = 2(-\frac{1}{5}) \therefore B = -\frac{2}{5}$$

$$\Rightarrow Y_p(t) = -\frac{2}{5} e^{-t} \sin(t) - \frac{1}{5} e^{-t} \cos(t)$$

$$Y(x) = C_1 e^{-x} + C_2 e^{-2x}$$

$$Y_p(x) = A e^{-x} \cdot [B \sin(x) + C \cos(x)]$$

$$B \frac{d}{dt} (e^{-t} \sin(t)) = -e^{-t} \sin(t) + e^{-t} \cos(t)$$

$$C \frac{d}{dt} (e^{-t} \cos(t)) = -e^{-t} \cos(t) - e^{-t} \sin(t)$$

$$Y_p(t) = -B e^{-t} \sin(t) + B e^{-t} \cos(t) - C e^{-t} \cos(t) - C e^{-t} \sin(t)$$

$$Y_p''(t) = -B(-e^{-t} \sin(t) + e^{-t} \cos(t)) + B(-e^{-t} \cos(t) - e^{-t} \sin(t)) - C(-e^{-t} \cos(t) - e^{-t} \sin(t)) - C(-e^{-t} \sin(t) + e^{-t} \cos(t))$$

$$Y_p''(t) = B e^{-t} \sin(t) - B e^{-t} \cos(t) - B e^{-t} \cos(t) - B e^{-t} \sin(t) + C e^{-t} \cos(t) + C e^{-t} \sin(t) + C e^{-t} \sin(t) - C e^{-t} \cos(t)$$

$$Y_p''(t) = -2B e^{-t} \cos(t) + 2C e^{-t} \sin(t)$$

$$3Y_p(t) = -3B e^{-t} \sin(t) + 3B e^{-t} \cos(t) - 3C e^{-t} \cos(t) - 3C e^{-t} \sin(t)$$

$$2Y_p(t) = B e^{-t} \sin(t) + C e^{-t} \cos(t)$$

$$= -2B e^{-t} \cos(t) + 2C e^{-t} \sin(t) - 3B e^{-t} \sin(t) + 3B e^{-t} \cos(t) - 3C e^{-t} \cos(t) - 3C e^{-t} \sin(t) + B e^{-t} \sin(t) + C e^{-t} \cos(t)$$

$$\Rightarrow B e^{-t} \cos(t) - C e^{-t} \sin(t) - 2B e^{-t} \sin(t) - 2C e^{-t} \cos(t) = e^{-t} \sin(t)$$

$$\Rightarrow [C \cos(t)(B e^{-t} - 2C e^{-t})] + [\sin(t)(-C e^{-t} - 2B e^{-t})] = e^{-t} \sin(t) + (0) \cos(t)$$

$$\bullet B e^{-t} - 2C e^{-t} = 0 \therefore B e^{-t} = 2C e^{-t} \therefore B = 2C$$

$$\bullet -C e^{-t} - 2B e^{-t} = e^{-t} \therefore e^{-t}(-C - 2B) = e^{-t} \therefore -C - 2B = 1 \therefore -C - 4C = 1 \therefore C = -\frac{1}{5}$$

$$\Rightarrow B = 2(-\frac{1}{5}) \therefore B = -\frac{2}{5}$$

$$\Rightarrow Y_p(t) = -\frac{2}{5} e^{-t} \sin(t) - \frac{1}{5} e^{-t} \cos(t)$$

$$\Rightarrow \div(e^{-t})? \rightarrow x t \quad Y_p(t) = -\frac{2}{5} t e^{-t} - \frac{1}{5} e^{-t} \cos(t)$$

$$\text{III - Solução geral: } Y(x) = C_1 e^{-x} + C_2 e^{-2x} - \frac{2}{5} t e^{-t} - \frac{1}{5} e^{-t} \cos(t)$$

$$10) y'' - 5y' + 6y = t^3 - t^2 + t - 1 \Rightarrow y(x) = C_1 e^{3t} + C_2 e^{2t} + \frac{1}{6}t^3 + \frac{1}{4}t^2 + \frac{5}{12}t + \frac{7}{72}$$

I - Homogeneous

$$\Delta = 1 \therefore \sqrt{\Delta} = 1 \therefore R = \frac{5+1}{2(1)} \therefore \boxed{R_1 = 3} \quad \boxed{R_2 = 2} \quad \therefore \boxed{Y_c(t) = C_1 e^{3t} + C_2 e^{2t}}$$

II - Particular

$$Y_p(t) = At^3 + Bt^2 + Ct + D \quad \left\{ \begin{array}{l} 6At + 2B \\ (At + Bt + Ct + D) - 5(3At^2 + 2Bt + C) + 6(At^3 + Bt^2 + Ct + D) = t^3 - t^2 + t - 1 \end{array} \right.$$

$$\left. \begin{array}{l} Y_p'(t) = 3At^2 + 2Bt + C \\ Y_p''(t) = 6At + 2B \end{array} \right\} \begin{array}{l} 6At + 2B - 15At^2 - 10Bt - 5C + 6At^3 + 6Bt^2 + 6Ct + 6D = t^3 - t^2 + t - 1 \\ 6At^3 = t^3 \therefore \boxed{A = \frac{1}{6}} \end{array}$$

$$\Rightarrow -15At^2 + 6Bt^2 = -t^2 \therefore -15A + 6B = -1 \therefore -15\left(\frac{1}{6}\right) + 6B = -1 \therefore -\frac{5}{2} + 6B = -1$$

$$\Rightarrow 6B = -1 + \frac{5}{2} \therefore 6B = \frac{-2+5}{2} \therefore 12B = 3 \therefore \boxed{B = \frac{1}{4}}$$

$$\Rightarrow 6At - 10Bt + 6Ct = t \therefore 6A - 10B + 6C = 1 \therefore 6\left(\frac{1}{6}\right) - 10\left(\frac{1}{4}\right) + 6C = 1 \therefore 1 - \frac{5}{2} + 6C = 1$$

$$\Rightarrow -\frac{5}{2} + 6C = 0 \therefore 6C = \frac{5}{2} \therefore \boxed{C = \frac{5}{12}} \quad \left\{ \begin{array}{l} 2B - 5C + 6D = -1 \therefore 2\left(\frac{1}{4}\right) - 5\left(\frac{5}{12}\right) + 6D = -1 \end{array} \right.$$

$$\Rightarrow \frac{1}{2} - \frac{25}{12} + 6D = -1 \therefore \frac{6-25+72D}{12} = -1 \therefore 72D = -12 - 6 + 25 \therefore 72D = \frac{11}{2} \therefore \boxed{D = \frac{11}{72}}$$

Litsa 09 - EDO - Parafma 8

$$(1) y'' + 4y' + 3y = 4t^3 + 2t^2 + 3t + 1$$

I - Homogénea

$$y'' + 4y' + 3y = 0 \quad \therefore D = 4 \quad \therefore \sqrt{D} = 2 \quad \therefore R = -\frac{4 \pm 2}{2(1)} \quad \therefore \boxed{R_1 = -1} \quad \boxed{R_2 = -3} \quad \therefore \boxed{Y_c(t) = C_1 e^{-t} + C_2 e^{-3t}}$$

II - Particular

$$\begin{aligned} Y_p(t) &= At^3 + Bt^2 + Ct + D \\ Y_p'(t) &= 3At^2 + 2Bt + C \\ Y_p''(t) &= 6At + 2B \end{aligned} \quad \left. \begin{aligned} (6At + 2B) + 4(3At^2 + 2Bt + C) + 3(At^3 + Bt^2 + Ct + D) &= 4t^3 + 2t^2 + 3t + 1 \\ (6At + 2B) + (12At^2 + 8Bt + 4C) + (3At^3 + 3Bt^2 + 3Ct + 3D) &= 4t^3 + 2t^2 + 3t + 1 \\ \Rightarrow 3At^3 = 4t^3 \quad \therefore 3A = 4 \quad \therefore \boxed{A = \frac{4}{3}} \end{aligned} \right.$$

$$\Rightarrow 12At^2 + 3Bt^2 + 3Bt^2 = 2t^2 \quad \therefore 12A + 3B = 2 \quad \therefore 12\left(\frac{4}{3}\right) + 3B = 2 \quad \therefore 16 + 3B = 2 \quad \therefore \boxed{B = -\frac{14}{3}}$$

$$\Rightarrow 6At + 8Bt + 3Ct = 3t \quad \therefore 6A + 8B + 3C = 3 \quad \therefore 6\left(\frac{4}{3}\right) + 8\left(-\frac{14}{3}\right) + 3C = 3 \quad \therefore 8 - \frac{112}{3} + 3C = 3$$

$$\Rightarrow 3C = \frac{3 - 8 + \frac{112}{3}}{\frac{1}{3}} \quad \therefore 3C = \frac{9 - 24 + 112}{3} \quad \therefore 9C = 97 \quad \therefore \boxed{C = \frac{97}{9}}$$

$$\Rightarrow 2B + 4C + 3D = 1 \quad \therefore 2\left(-\frac{14}{3}\right) + 4\left(\frac{97}{9}\right) + 3D = 1 \quad \therefore \boxed{D = -\frac{295}{27}}$$

III - Solución general

$$\boxed{Y(x) = C_1 e^{-t} + C_2 e^{-3t} + \frac{4}{3}t^3 - \frac{14}{3}t^2 + \frac{97}{9}t - \frac{295}{27}}$$

Raxumho

(2)

$$y'' - 2y' + 2y = e^t \cos(t)$$

I-themo.

$$y'' - 2y' + 2y = 0 \therefore \Delta = 0 \therefore R = \frac{2}{2} \therefore R_1 = 1, R_2 = 1$$

$$y(x) = C_1 e^x + X C_2 e^x$$

II- Particular

$$e^t (A \sin(t) + B \cos(t)) \Rightarrow y_p = A e^t \sin(t) + B e^t \cos(t)$$

$$y_p'(t) = A (e^t \sin(t) + e^t \cos(t)) + B (e^t \cos(t) - e^t \sin(t))$$

$$y_p''(t) = A [(e^t \sin(t)) + (e^t \cos(t))] + B [(e^t \cos(t)) - (e^t \sin(t))] - ((e^t \sin(t)) + (e^t \cos(t)))$$

$$y_p''(t) = A e^t \sin(t) + A e^t \cos(t) + B e^t \cos(t) - B e^t \sin(t) - B e^t \sin(t) - B e^t \cos(t)$$

$$y_p''(t) = 2A e^t \cos(t) - 2B e^t \sin(t)$$

$$-2y'_p(t) = -2A e^t \sin(t) - 2A e^t \cos(t) - 2B e^t \cos(t) + 2B e^t \sin(t)$$

$$+ 2y_p(t) = A e^t \sin(t) + B e^t \cos(t)$$

$$\Rightarrow = 2A e^t \cos(t) - 2B e^t \sin(t) - 2A e^t \sin(t) - 2A e^t \cos(t) - 2B e^t \cos(t) + 2B e^t \sin(t) + A e^t \sin(t) + B e^t \cos(t)$$

$$= -A e^t \sin(t) - B e^t \cos(t) \Rightarrow -A e^t \sin(t) - B e^t \cos(t) = e^t \cos(t) + (0) e^t \sin(t)$$

$$\Rightarrow -A e^t \sin(t) = 0 e^t \sin(t) \therefore A = 0$$

$$\Rightarrow -B e^t \cos(t) = e^t \cos(t) \therefore -B = 1 \therefore B = 1$$

$$y_p(t) = e^t \cos(t) \rightsquigarrow L.D \rightsquigarrow x(t)$$

$$\Rightarrow y_p(t) = t^2 e^t \cos(t)$$

$$\Rightarrow y(x) = C_1 e^x + t e^x C_2 + t^2 e^t \cos(t)$$

Linha 9 - EDO - Resposta de Resumo

(18) $y'' + 6y' + 9y = e^t (3\cos(t) - \sin(t))$

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

$$\Delta = 36 - 36 = 0$$

$$R = -\frac{6}{2} \Rightarrow R_1 = -3, R_2 = -3$$

$$Y_c(t) = C_1 e^{-3t} + t C_2 e^{-3t}$$

II - Particular

$$Y_p(t) = A e^t (B \sin(t) + C \cos(t)) = e^t (D \sin(t) + E \cos(t))$$

$$Y_p'(t) = e^t (D \sin(t) + E \cos(t)) + e^t (D \cos(t) - E \sin(t)) = D e^t \sin(t) + E e^t \cos(t) + D e^t \cos(t) - E e^t \sin(t)$$

$$Y_p''(t) = D(e^t \sin(t) + e^t \cos(t)) + E(e^t \cos(t) - e^t \sin(t)) + D(e^t \cos(t) - e^t \sin(t)) - E(e^t \sin(t) + e^t \cos(t))$$

$$Y_p''(t) = D e^t \sin(t) + D e^t \cos(t) + E e^t \cos(t) - E e^t \sin(t) + D e^t \cos(t) - D e^t \sin(t) - E e^t \sin(t) - E e^t \cos(t)$$

$$Y_p''(t) = 2D e^t \cos(t) - 2E e^t \sin(t)$$

$$G Y_p(t) = G D e^t \sin(t) + G E e^t \cos(t) + G D e^t \cos(t) - G E e^t \sin(t)$$

$$G Y_p(t) = 9 D e^t \sin(t) + 9 E e^t \cos(t)$$

+

$$2D e^t \cos(t) - 2E e^t \sin(t) + G D e^t \sin(t) + G E e^t \cos(t) + G D e^t \cos(t) - G E e^t \sin(t) + 9 D e^t \sin(t) + 9 E e^t \cos(t)$$

$$\Rightarrow 8D e^t \cos(t) - 8E e^t \sin(t) + 15D e^t \sin(t) + 15E e^t \cos(t) = e^t$$

$$\Rightarrow e^t (8D \cos(t) - 8E \sin(t) + 15D \sin(t) + 15E \cos(t)) = e^t \quad (1)$$

$$\Rightarrow \sin(t)(15D - 8E) + \cos(t)(15E + 8D) = 1 \quad \therefore \text{Lembrando que: } \sin^2 t + \cos^2 t = 1$$

$$\hookrightarrow 15D - 8E = \sin(t), 15E + 8D = \cos(t) \Rightarrow \boxed{D = \frac{\sin(t) + 8E}{15}}$$

$$\Rightarrow 15E + 8 \left(\frac{\sin(t) + 8E}{15} \right) = \cos(t) \quad \therefore 225E + 8 \sin(t) + 64E = \cos(t)$$

$$14) y'' - 4y' + 8y = t^2 e^t$$

I-Homogênea

$$\Delta = 16 - 32 = -16$$

$$\sqrt{\Delta} = 4i$$

$$R = \frac{4+4i}{2} \therefore R = 2+2i \therefore b=2, a=2 \therefore y_c(t) = C_1 e^{2t} \sin(2t) + C_2 e^{2t} \cos(2t)$$

II- Particular

$$y_p(t) = Aet(Be^{t^2} + Ct + D) \therefore y_p(t) = e^t(Et^2 + ft + G)$$

$$y'_p(t) = e^t(Et^2 + ft + G) + e^t(2Et + f)$$

$$y''_p(t) = [e^t(Et^2 + ft + G) + e^t(2Et + f)] + [e^t(2Et + f) + e^t(2E)]$$

$$y''_p(t) = e^t(Et^2 + ft + G) + 2e^t(2Et + f) + e^t(2E)$$

$$-4y'_p(t) = -4e^t(Et^2 + ft + G) - 4e^t(2Et + f)$$

$$8y_p(t) = 8e^t(Et^2 + ft + G)$$

⊕

$$e^t(Et^2 + ft + G) + 2e^t(2Et + f) + e^t(2E) - 4e^t(Et^2 + ft + G) - 4e^t(2Et + f) + 8e^t(Et^2 + ft + G)$$

$$e^t(Et^2 + ft + G) + e^t(4Et + 2f) + e^t(2E) + e^t(-4Et^2 - 4ft - 4G) + e^t(-8Et - 4f) + e^t(8Et^2 + 8ft + 8G)$$

$$\Rightarrow e^t(Et^2 + ft + G + 4Et + 2f + 2E - 4Et^2 - 4ft - 4G - 8Et - 4f + 8Et^2 + 8ft + 8G)$$

~~$$5Et^2(0) = f(0) \Rightarrow E = \frac{1}{5}$$~~

~~$$5ft = 0 \therefore f = 0 \Rightarrow f(f + 4E - 4f - 8E + 8f) = 0 \therefore 5f + 4\left(\frac{1}{5}\right) = 0 \Rightarrow 5f = \frac{4}{5} \Rightarrow f = \frac{4}{25}$$~~

$$\Rightarrow 5G + 2f + 2E = 0 \therefore 5G - 2\left(\frac{4}{25}\right) + 2\left(\frac{1}{5}\right) = 0 \therefore 5G - \frac{8}{25} + \frac{2}{5} = 0 \times (25) \therefore 100G - 8 + 10 = 0$$

$$\Rightarrow 100G = -2 \therefore G = -\frac{1}{50}$$

III- Sol. Geral

~~$$y(x) = C_1 e^{2t} \sin(2t) + C_2 e^{2t} \cos(2t) + e^t \left(\frac{1}{5}t^2 + \frac{4}{25}t + -\frac{1}{50} \right)$$~~

$$16) y'' - 5y' + 6y = (t^2 + 1)e^{2t}$$

I-Homogênea

$$\Delta = 1 \therefore R = \frac{5 \pm 1}{2(1)} \therefore R_1 = 3 \quad R_2 = 2 \quad \therefore Y_C(t) = C_1 e^{3t} + C_2 e^{2t}$$

II-Particular

$$Y_p(t) = (At^2 + Bt + C)e^{2t} \therefore Y_p(t) = (Et^2 + Ft + G)e^{2t}$$

* Por essa incluir a solução da homogênea, ou seja, ser linearmente dependente, multiplicar por t.

$$Y_p(t) = (te^{2t})(Et^2 + Ft + G)$$

$$Y_p'(t) = [e^{2t} + 2te^{2t}](Et^2 + Ft + G) + [(te^{2t})](2Et + F)$$

$$Y_p''(t) = [(2te^{2t} + 2e^{2t} + 4te^{2t})(Et^2 + Ft + G) + (e^{2t} + 2te^{2t})(2Et + F)] + [(e^{2t} + 2te^{2t})(2Et + F) + (te^{2t})(2E)]$$

$$Y_p'''(t) = (6te^{2t} + 2e^{2t})(Et^2 + Ft + G) + (e^{2t} + 2te^{2t})(2Et + F) + (e^{2t} + 2te^{2t})(2Et + F) + (t^2e^{2t})(2E)$$

$$Y_p''(t) = (6te^{2t} + 2e^{2t})(Et^2 + Ft + G) + 2(e^{2t} + 2te^{2t})(2Et + F) + (t^2e^{2t})(2E)$$

$$Y_p''(t) = 6Ee^{2t}t^3 + 6fe^{2t}t^2 + 6Ge^{2t} + 2\dot{E}e^{2t}t^2 + 2f\dot{e}^{2t}t + 2Ge^{2t} + (2e^{2t} + 4te^{2t})(2Et + F) + 2Et^2e^{2t}$$

$$Y_p''(t) = 6(Ee^{2t}t^3 + fe^{2t}t^2 + Ge^{2t}) + 2e^{2t}(2Et^2 + Ft + G) + 2e^{2t}[(1+2t)(2Et + F)t^2]$$

$$Y_p''(t) = 6e^{2t}(Et^3 + Ft^2 + G) + 2e^{2t}[(2Et^2 + Ft + G) + (2Et + 4Et^2 + F + 2Ft) + Et^2]$$

$$Y_p''(t) = 6e^{2t}(Et^3 + Ft^2 + G) + 2e^{2t}[7Et^2 + 3Ft + 2Et + F + G]$$

$$Y_p''(t) = e^{2t}[6(Et^3 + Ft^2 + G) + 2(7Et^2 + 3Ft + 2Et + F + G)]$$

$$Y_p''(t) = \cancel{e^{2t}}[6Et^3 + 6Ft^2 + \cancel{6G} + 14Et^2 + 6Ft + 4Et + 2F + 2G] = e^{2t}(t^2 + 1)$$

$$6\dot{E}t^3 + 6\dot{F}t^2 + 14\dot{E}t^2 + 4\dot{E}t + 6\dot{F}t + 2\dot{F} + 8G = t^2 + 1$$

$$6\dot{F}t^2 + 14\dot{E}t^2 = 1 \therefore 6f + 14E = 1 \therefore f = \frac{1}{6}$$

$$6Et^3 = 0t^3 \therefore \cancel{E=0}$$

~~$$(4E + 6f) = 0 \therefore 2f + 8G = 1 \rightarrow \frac{1}{3} + 8G = 1 \therefore 8G = \frac{2}{3} \therefore G = \frac{1}{12}$$~~

$$Y(t) = C_1 e^{3t} + C_2 e^{2t} + (te^{2t})\left(\frac{1}{6}t + \frac{1}{12}\right)$$