

Actividad 4.

Díaz Hernández Marcos Bryan

Ecuaciones Diferenciales Grupo: 25

Tarea.

$$1) y'' - 2y' - 8y = 0 \quad y(0) = 0, y'(0) = 1$$

$$D^2y - 2Dy - 8y = 0 \Rightarrow (D^2 - 2D - 8)y = 0$$

$$r^2 - 2r - 8 = \frac{2 \pm \sqrt{4 + 32}}{2} = \frac{2 \pm 6}{2} = 1 \pm 3 = r = 4$$

$$r = -2$$

$$y_h = y_g = C_1 e^{4x} + C_2 e^{-2x} \quad y(0) = 0 \quad y'(0) = 1$$

$$y_h = C_1 e^0 + C_2 e^0 \quad y' = 4C_1 e^{4x} - 2C_2 e^{-2x}$$

$$1) C_1 + C_2 = 0 \quad C_1 = -C_2 \text{ en 2) } -4C_2 - 2C_2 = 1$$

$$2) 4C_1 - 2C_2 = 1$$

$$-6C_2 = 1$$

$$C_2 = -1/6$$

$$C_1 = 1/6$$

$$y = \frac{1}{6} e^{4x} - \frac{1}{6} e^{-2x} \quad \text{Sol. particular}$$

Scribe

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$$2) \quad y'' + 4y' + 4y = 0 \quad y(0) = y'(0) = 1$$

$$D^2y + 4Dy + 4y = 0 \rightarrow (D^2 + 4D + 4)y = 0$$

$$r^2 + 4r + 4 = 0$$

$$\frac{-4 \pm \sqrt{16 - 16}}{2} = -2 \quad r_1, r_2 = -2$$

$$y_g = C_1 e^{-2x} + C_2 x e^{-2x}$$

$$y'_g = -C_1 2e^{-2x} + C_2 [(x)(-2e^{-2x}) + (e^{-2x})]$$

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

$$y(0) = 1 \rightarrow C_1 e^0 + 0 = 1 \quad C_1 = 1$$

$$y'(0) = 1 \rightarrow -2C_1 e^0 - 0 + C_2 e^0 = 1$$

$$-2C_1 + C_2 = 1$$

$$-2 + C_2 = 1$$

$$C_2 = 3$$

$$y = \frac{e^{-2x}}{1} + 3x e^{-2x} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{sol. particular}$$

$$3) \quad y'' - 8y' + 20y = 0 \quad y(0) = 1, y'(0) = 0$$

$$D^2y - 8Dy + 20y = 0 \rightarrow (D^2 - 8D + 20)y = 0$$

$$r^2 - 8r + 20$$

$$\frac{8 \pm \sqrt{64 - 80}}{2} = \frac{8 \pm 4i}{2} = 4 \pm 2i \quad r_1 = 4 + 2i, r_2 = 4 - 2i$$

$$y_g = e^{4x} (C_1 \cos(2x) + C_2 \sin(2x))$$

$$y'_g = e^{4x} (-2C_1 \sin(2x) + 2C_2 \cos(2x)) + (C_1 \cos(2x) + C_2 \sin(2x)) 4e^{4x}$$

$$y(0) = 1 \rightarrow C_1 (\cos(0)) + C_2 \sin(0) = 1 \quad C_1 = 1$$

$$y'(0) = 0 \rightarrow 2C_2 + (C_1)(4) = 4 + 2C_2 = 0 \quad C_2 = -2$$

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$$y = \frac{e^{4x} (\cos(2x) - 2 \sin(2x))}{4}$$

$$4) \frac{d^4 y}{dx^4} + 2 \frac{d^2 y}{dx^2} + y = 0$$

$$D^4 y + 2 D^2 y + y = 0 \rightarrow (D^4 + 2 D^2 + 1) y = 0$$

$$\lambda^4 + 2\lambda^2 + 1 = 0 \quad \lambda^2 = -1 \quad \lambda = \pm i$$

$$y_1 = e^0 (C_1 \cos(x) + C_2 \sin(x))$$

$$x e^0 (C_3 \cos(x) + C_4 \sin(x))$$

$$\lambda^2 + 2\lambda + 1 = 0$$

$$\lambda = \frac{-2 \pm \sqrt{4-4}}{2} = -1$$

$$y_2 = C_1 \cos(x) + C_2 \sin(x) + x(C_3 \cos(x) + C_4 \sin(x))$$

$$\lambda_1 = -1 \quad \lambda_2 = -1$$

$$\lambda_1 = -1 \quad \lambda_2 = -1$$

$$5) y''' - y = 0 \rightarrow D^3 y - y = 0 \quad (D^3 - 1) y = 0 \quad \lambda^3 - 1 = 0 \quad \lambda^3 = 1$$

$$y_1 = C_1 e^x + C_2 x e^x + C_3 x^2 e^x$$