

## Actividad

Nombre: Jannys Alexander Pucha Carrera

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Curso: 4to "A"

- Obtenga la solución general de la ecuación diferencial dada y comprobar con una solución obtenida (ya sea)

$$1. y'' - 6y' + 9y = 0$$

$$m^2 e^{mx} - 6m e^{mx} + 9e^{mx} = 0$$

$$e^{mx} (m^2 - 6m + 9) = 0$$

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

$$y = e^{mx}$$

$$y' = m e^{mx}$$

$$y'' = m^2 e^{mx}$$

$$m_1 = 3$$

$$m_2 = 3$$

$$y_1 = C_1 e^{3x}$$

$$y_2 = x C_2 e^{3x}$$

$$y = C_1 e^{3x} + x C_2 e^{3x}$$

- Comprobación

$$y = e^{3x}$$

$$y' = 3e^{3x} \quad y'' = 9e^{3x}$$

$$9e^{3x} - 6(3e^{3x}) + 9e^{3x} = 0$$

$$9e^{3x} - 18e^{3x} + 9e^{3x} = 0$$

$$18e^{3x} - 18e^{3x} = 0$$

$$0 = 0 //$$

$$2. y'' - 3y' + 2y = 0$$

$$m^2 e^{mx} - 3m e^{mx} + 2e^{mx} = 0$$

$$e^{mx} (m^2 - 3m + 2) = 0$$

$$(m-2)(m-1) = 0$$

$$m_1 = 2$$

$$m_2 = 1$$

$$y_1 = C_1 e^{2x}$$

$$y_2 = C_2 e^x$$

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



Comprobación:  $e^{2x}$

$$y = e^{2x} \quad y' = 2e^{2x} \quad y'' = 4e^{2x}$$

$$4e^{2x} - 3(2e^{2x}) + 2(e^{2x}) = 0$$

$$4e^{2x} - 6e^{2x} + 2e^{2x} = 0$$

$$6e^{2x} - 6e^{2x} = 0$$

$$0 = 0 //$$

$$3. \frac{\partial^2 y}{\partial x^2} + 8 \frac{\partial y}{\partial x} + 16y = 0$$

$$y'' + 8y' + 16y = 0$$

$$m^2 e^{mx} + 8m e^{mx} + 16 e^{mx} = 0$$

$$e^{mx} (m^2 + 8m + 16) = 0$$

$$(m+4)(m+4) = 0$$

$$y = e^{mx}$$

$$y'' = m^2 e^{mx}$$

$$y = m e^{mx}$$

$$m_1 = -4$$

$$m_2 = -4$$

$$y_1 = C \cdot e^{-4x}$$

$$y_2 = xC \cdot e^{-4x}$$

$$y = C \cdot e^{-4x} + x \cdot C \cdot e^{-4x}$$

Comprobación:  $e^{-4x}$

$$y = e^{-4x} \quad y' = -4e^{-4x} \quad y'' = 16e^{-4x}$$

$$-16e^{-4x} + 8(-4e^{-4x}) + 16(e^{-4x}) = 0$$

$$-16e^{-4x} - 32e^{-4x} + 16e^{-4x} = 0$$

$$0 = 0 //$$



$$4. \frac{d^2 y}{dx^2} - 10 \frac{dy}{dx} + 25y = 0$$

$$y'' - 10y' + 25y = 0$$

$$m^2 e^{mx} - 10 m e^{mx} + 25 e^{mx} = 0$$

$$e^{mx} (m^2 - 10m + 25) = 0$$

$$(m-5)(m-5) = 0$$

$$m_1 = 5$$

$$m_2 = 5$$

$$y_1 = C_1 e^{5x}$$

$$y_2 = x \cdot C_2 e^{5x}$$

$$y = C_1 e^{5x} + x C_2 e^{5x}$$

Comprobación:  $e^{5x}$

$$y = e^{mx}$$

$$y' = 5m e^{mx} \quad y'' = 25m^2 e^{mx}$$

$$25m^2 e^{mx} - 10(5m e^{mx}) + 25e^{mx} = 0$$

$$25m^2 e^{mx} - 50m e^{mx} + 25e^{mx} = 0$$

$$0 = 0$$

$$5. y'' + 3y' - 5y = 0$$

$$y = e^{mx} \quad y' = m e^{mx} \quad y'' = m^2 e^{mx}$$

$$m^2 e^{mx} + 3m e^{mx} - 5e^{mx} = 0$$

$$e^{mx} (m^2 + 3m - 5) = 0$$

$$a = 1 \quad m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-3 \pm \sqrt{3^2 - 4(1)(-5)}}{2(1)}$$

$$b = 3$$

$$c = -5$$

$$= \frac{-3 \pm \sqrt{9 + 20}}{2} = \frac{-3 \pm \sqrt{29}}{2}$$

$$y = C_1 e^{\frac{-3 + \sqrt{29}}{2} x}$$

$$m_1 = \frac{-3 + \sqrt{29}}{2}$$

$$m_2 = \frac{-3 - \sqrt{29}}{2}$$

$$y_2 = C_2 e^{\frac{-3 - \sqrt{29}}{2} x}$$

$$y = C_1 e^{\frac{-3 + \sqrt{29}}{2} x} + C_2 e^{\frac{-3 - \sqrt{29}}{2} x}$$



Comprobación:  $C_1 \cdot e^{\frac{-3+\sqrt{29}x}{2}}$

$$y = e^{\frac{-3+\sqrt{29}x}{2}}$$

$$y' = \frac{-3+\sqrt{29}}{2} e^{\frac{-3+\sqrt{29}x}{2}}$$

$$y'' = \frac{9\sqrt{29}-87}{4} e^{\frac{-3+\sqrt{29}x}{2}}$$

$$\frac{9\sqrt{29}-87}{4} e^{\frac{-3+\sqrt{29}x}{2}} + 3 \left( \frac{-3+\sqrt{29}}{2} e^{\frac{-3+\sqrt{29}x}{2}} \right) - 5 e^{\frac{-3+\sqrt{29}x}{2}} = 0$$

$$\frac{9\sqrt{29}-87}{4} e^{\frac{-3+\sqrt{29}x}{2}} - \frac{9\sqrt{29}-87}{4} = 0$$

$$0=0!!$$

6.  $y'' + 4y' - y = 0$

$$y = e^{mx} \quad y' = m e^{mx} \quad y'' = m^2 e^{mx}$$

$$m^2 e^{mx} + 4m e^{mx} - e^{mx} = 0$$

$$e^{mx}(m^2 + 4m - 1) = 0$$

$$a=1$$

$$b=4$$

$$c=-1$$

$$m = \frac{-4 \pm \sqrt{4^2 - 4(1)(-1)}}{2}$$

$$m = \frac{-4 \pm \sqrt{16+4}}{2} = \frac{-4 \pm \sqrt{20}}{2} = \frac{-4 \pm \sqrt{2^2 \cdot 5}}{2}$$

$$m_1 = \frac{-2 + 1 - 2 + \sqrt{5}}{2}$$

$$m_1 = -2 + \sqrt{5}$$

$$m_2 = -2 - \sqrt{5}$$

$$y_1 = C_1 \cdot e^{-2+\sqrt{5}x}$$

$$y_2 = C_2 \cdot e^{-2-\sqrt{5}x}$$

$$y = C_1 \cdot e^{-2+\sqrt{5}x} + C_2 \cdot e^{-2-\sqrt{5}x}$$

Comprobação:

$$y = e^{-2+\sqrt{5}x}$$

$$y' = -2 + \sqrt{5} e^{-2+\sqrt{5}x}$$

$$y'' = -20e^{-2+\sqrt{5}x}$$

$$-20e^{-2+\sqrt{5}x} - 8 + \sqrt{5} e^{-2+\sqrt{5}x} - 9e^{-2+\sqrt{5}x} = 0$$

$$0 = 0 //$$