$$F(x, y(x), y'(x), \ldots) = 0$$

solución $y(x)$

EM que contiene al menos una de las derivadas de una función desconocida llamada incógnita.

+ Resolver una ED.

Encontrar la forma de la incógnita que satisface la ecuación

$$\frac{dy}{dx} = 0 \longrightarrow y = c_1$$

$$\frac{dy}{dx} = y \longrightarrow y = e^x$$

$$\frac{dy}{dx} = e^x$$

$$e^x = e^x$$

$$e^x - e^x = 0$$

$$0 = 0$$

$$\frac{dy}{dx} - y = 0$$

$$F\left(x, y, \frac{dy}{dx}\right) = 0$$

$$\frac{d^2y}{dx^2} - y = 5x$$

$$F\left(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2}\right) = Q(x)$$

EDO(2) NH.

$$F\left(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2}\right) = 0$$

EDO(2) $H_{(A)}$

$$F\left(x, y, \frac{dy}{dx}\right) = 0$$

$y(x)$ solución general

$y(0) = 9$

una y sólo una

$y(0) = 9$ solución particular

infinito.

$$y_g = C_1 \cos(3x) + C_2 \operatorname{sen}(3x)$$

$$\frac{dy}{dx} = -3C_1 \operatorname{sen}(3x) + 3C_2 \cos(3x)$$

$$\frac{d^2y}{dx^2} = -9C_1 \cos(3x) - 9C_2 \operatorname{sen}(3x$$

$$= -9\left(C_1 \cos(3x) + C_2 \operatorname{sen}(3x)\right)$$

$$\frac{d^2y}{dx^2} = -9y \longrightarrow \boxed{\frac{d^2y}{dx^2} + 9y = 0}$$

$$y = C_1 \cos(3x) + C_2 \operatorname{sen}(3x)$$

$y(0) = 4 \qquad y(0) \Rightarrow 4 = C_1 \cos(3(0)) + C_2 \operatorname{sen}(3(0))$

$y'(0) = -6 \qquad 4 = C_1(1) + C_2(0) \quad \boxed{C_1 = 4}$

$$y' = -3C_1 \operatorname{sen}(3x) + 3C_2 \cos(3x)$$

$y'(0) \Rightarrow -6 = -3(4)(0) + 3(C_2)(1)$

$-6 = 3C_2 \quad \boxed{C_2 = -2}$

$$y_p = 4\cos(3x) - 2\operatorname{sen}(3x)$$

$$F(x, y, y', y'', y''',) = 0$$

$$y = c_1 y_1 + c_2 y_2 + c_3 y_3$$

$$y_p = y_1 \qquad y_p = y_2 \qquad y_p = y_3$$

$$y_p = 3y_1 + 4y_2$$

Clasificación ED

ED
- EDO ordinarias — I, II, III — $F\left(x, y, \frac{dy}{dx}\right) = 0$, $y(x)$
- EDyDP en derivadas parciales — IV — $F\left(x, y, z(x,y), \frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}\right) = 0$

- ED (orden)
  - EDO III
    - 1er orden I
    - orden superior a 1. II
  - EDP IV
    - 1er orden
    - orden superior

	FAC.	VIDA REAL
EDO	80%	20%
EDenDP	20%	80%

EDO

- 1er orden — I
  - lineales
    - Hom.
    - No Hom.
    - I. 2
      - CV.
      - CC.
      - II. 2
  - No Lineales ⊗ I. 1 ⊗
- orden sup — II
  - lineales
    - Hom.
    - No hom.
      - CV ×
      - CC.
      - II
  - no lineales ⊗ × ⊗

$$a_0(x)\frac{d^n y}{dx^n} + a_1(x)\frac{d^{n-1}y}{dx^{n-1}} + \ldots\ldots + a_{n-1}(x)\frac{dy}{dx} + a_n(x)y = Q(x)$$

EDO(n) CV NH $\underline{\underline{L}}$.

$$\frac{dy}{dx} + x^2 y = 5x^2$$

EDO(1) CV NH Lineal

$a_0(x)=1 \quad a_1(x)=x^2 \quad Q(x)=5x^2$

$$\frac{dy}{dx} + \frac{x^2}{y} = 5x^2$$

EDO(1) CV NH $\underline{NL}$

$$x^2 \frac{dy}{dx} \cdot y = 5x^2$$

EDO(1) CU NH = NL

$$e^y + \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} + x^2 \cos(y) = 5x^2$$

EDO(1) CU NH. NL

$$\frac{d^2y}{dx^2} + \cos(5x) \frac{dy}{dx} + 4e^x y = 8x^2$$

EDO(2) CU NH L

$$\sqrt{\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + \sqrt{y}} = 7x$$

ursularias.com/ECUACIONES.htm.

$$\frac{d^2y}{dx^2} + 4x^2\cos(3x) = 3y.$$

$$\frac{d^2y}{dx^2} - 3y = -4x^2\cos(3x)$$

$$a_0(x)\frac{d^2y}{dx^2} + a_1(x)\frac{dy}{dx} + a_2(x)y = Q(x)$$

$a_0(x) = 1$ $a_1(x) = 0$ $a_2(x) = -3$ $Q(x) = -4x^2\cos(3x)$

EDO(2) CC NH L.

$$y_{g/n-h} = y_{g/h} + y_{p/Q(x)}.$$