TAREA 2020-03

CLASIFICAR LAS SIG. ED. / Sábado 23:59

1- $\frac{dy}{dx} + xy = 0$ EDO(1)L cc H.

2- $\frac{d^2y}{dx^2} + \frac{dy}{dx} + x = \cos(x)$ EDO(2)L cc NH

3- $(x^2+y^2) + (x+y)\frac{dy}{dx} = 0$ EDO(1) NL

4- $xy^2\frac{dy}{dx} + y^3 = \frac{1}{x}$ EDO(1) NL

5- $\frac{dy}{dx} = \frac{y-x}{y+x}$ EDO(1) NL

EDO(1) NL 6- $3e^x\tan(y) + (2-e^x)\sec^2(y)\frac{dy}{dx} = 0$

7- $\frac{d^2y}{dx^2} + 4y = \operatorname{Sen}(2x)$ EDO(2)L cc NH.

8- $\frac{\partial^2 T}{\partial x^2} - k_1\frac{\partial^2 T}{\partial t^2} = 0$ EDeDP(2)

9- $\frac{\partial^2\theta}{\partial x^2} + a_1\frac{\partial^2\theta}{\partial y^2} + a_2\frac{\partial^2\theta}{\partial z^2} = 0$ EDeDP(2)

10- $\frac{\partial^3 u}{\partial x^3} + \left(\frac{\partial u}{\partial x}\right)\left(\frac{\partial^2 u}{\partial y^2}\right) = u.$ EDeDP(3)

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

$a_0(x) \neq 0$

$$\frac{d^5y}{dx^5} = 0 \quad \text{EDOL(5)cc H.}$$

$$y_g = c_1y_1 + c_2y_2 + c_3y_3 + c_4y_4 + c_5y_5$$

$$\frac{d^5y}{dx^5} = 0 \qquad \frac{d^4y}{dx^4} = c_{10}$$

$$\int d\left(\frac{d^3y}{dx^3}\right) = c_{10}\int dx$$

$$\frac{d^3y}{dx^3} + c_1 = c_{10}(x + c_2)$$

$$\frac{d^3y}{dx^3} = c_{10}x + (c_{10}c_2 - c_1)$$

$$\frac{d^3y}{dx^3} = c_{10}x + c_{20}$$

$$d\left(\frac{d^2y}{dx^2}\right) = (c_{10}x + c_{20})dx$$

$$\int d\left(\frac{d^2y}{dx^2}\right) = c_{10}\int x\,dx + c_{20}\int dx$$

$$\frac{d^2y}{dx^2} + c_3 = c_{10}\left(\frac{x^2}{2} + c_4\right) + c_{20}(x + c_5)$$

$$\frac{d^2y}{dx^2} = \frac{c_{10}}{2}x^2 + c_{20}x + (c_{10}c_4 + c_{20}c_5 - c_3)$$

$$\frac{d^2y}{dx^2} = \frac{c_{10}}{2}x^2 + c_{20}x + c_{30}$$

$$d\left(\frac{dy}{dx}\right) = \left(\frac{c_{10}}{2}x^2 + c_{20}x + c_{30}\right)dx$$

$$\int d\left(\frac{dy}{dx}\right) = \frac{c_{10}}{2}\int x^2dx + c_{20}\int x\,dx + c_{30}\int dx$$

$$\frac{dy}{dx} + c_6 = \frac{c_{10}}{2}\left(\frac{x^3}{3} + c_7\right) + c_{20}\left(\frac{x^2}{2} + c_8\right) + c_{30}(x + c_9)$$

$$\frac{dy}{dx} = \frac{c_{10}}{6}x^3 + \frac{c_{20}}{2}x^2 + c_{30}x + \left(\frac{c_{10}c_7}{2} + c_{20}c_8 + c_{30}c_9 - c_6\right)$$

$$\frac{dy}{dx} = \frac{c_{10}}{6}x^3 + \frac{c_{20}}{2}x^2 + c_{30}x + c_{40}$$

$$dy = \left(\frac{c_{10}}{6}x^3 + \frac{c_{20}}{2}x^2 + c_{30}x + c_{40}\right)dx$$

$$\int dy = \frac{c_{10}}{6}\int x^3dx + \frac{c_{20}}{2}\int x^2dx + c_{30}\int x\,dx + c_{40}\int dx$$

$$y + c_{11} = \frac{c_{10}}{6}\left(\frac{x^4}{4} + c_{12}\right) + \frac{c_{20}}{2}\left(\frac{x^3}{3} + c_{13}\right) + c_{30}\left(\frac{x^2}{2} + c_{14}\right) + c_{40}(x + c_{15})$$

$$y = \frac{c_{10}}{24}x^4 + \frac{c_{20}}{6}x^3 + \frac{c_{30}}{2}x^2 + c_{40}x + \left(\frac{c_{10}c_{12}}{6} + \frac{c_{20}c_{13}}{2} + c_{30}c_{14} + c_{40}c_{15} - c_{11}\right)$$

$$y = \frac{c_{10}}{24}x^4 + \frac{c_{20}}{6}x^3 + \frac{c_{30}}{2}x^2 + c_{40}x + c_{50}$$

$$\boxed{y = c_1x^4 + c_2x^3 + c_3x^2 + c_4x + c_5}$$

$$\frac{d^5y}{dx^5} = 0$$

EDO(1)NL.

$$M(x,y) + N(x,y)\frac{dy}{dx} = 0$$

$$P(x)Q(y) + R(x)S(y)\frac{dy}{dx} = 0$$

SG

$$\int \frac{P(x)}{R(x)}dx + \int \frac{S(y)}{Q(y)}dy = C$$

$$\boxed{F(x,y) = C}$$

$$M(x,y) + N(x,y)\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} \quad \therefore \quad \text{EXACTA.}$$

$$SG \Rightarrow \int M\,dx + \int \left[N - \frac{\partial}{\partial y}\int M\,dx \right] dy = C.$$

$$F(x,y) = C,$$

$$x(2x^2+y^2)+y(x^2+2y^2)\frac{dy}{dx}=0$$

$$\underbrace{(2x^3+xy^2)}_{M}+\underbrace{(x^2y+2y^3)}_{N}\frac{dy}{dx}=0$$

$$\frac{\partial M}{\partial y}=(0)+2xy \qquad \frac{\partial N}{\partial x}=2xy+(0)$$

EXACTA.

$$\int M\,dx=\int 2x^3dx+y^2\int x\,dx$$

$$=\frac{x^4}{2}+\frac{y^2x^2}{2}$$

$$\frac{\partial}{\partial y}\int M\,dx=(0)+yx^2$$

$$N-\frac{\partial}{\partial y}\int M\,dx=(\cancel{x^2y}+2y^3)-(\cancel{yx^2})$$

$$=2y^3$$

$$\int\left[N-\frac{\partial}{\partial y}\int M\,dx\right]dy=2\int y^3dy$$

$$=\frac{y^4}{2}$$

SG $$\frac{x^4}{2}+\frac{x^2y^2}{2}+\frac{y^4}{2}=C$$

$$\boxed{x^4+x^2y^2+y^4=C}$$

$$(2x^3+xy^2)+(x^2y+2y^3)\frac{dy}{dx}=0$$

$$\frac{\partial F}{\partial x}+\frac{\partial F}{\partial y}\cdot\frac{dy}{dx}=0$$

$$(4x^3+2xy^2)+(2x^2y+4y^3)\frac{dy}{dx}=0$$

$$\frac{dy}{dx}=-\frac{(2x^3+xy^2)}{x^2y+2y^3} \qquad \frac{dy}{dx}=-\frac{(4x^3+2xy^2)}{2x^2y+4y^3}$$

$$=-\frac{(2x^3+xy^2)}{x^2y+2y^3}$$

$$x^2y^2 + 2x^2y^3 + 4x^4 = C$$

$$F(x,y) = C$$

$$\frac{\partial F}{\partial x} + \frac{\partial F}{\partial y}\cdot\frac{dy}{dx} = 0$$

$$\left(2xy^2 + 4xy^3 + 16x^3\right) + \left(2x^2y + 6x^2y^2\right)\cdot\frac{dy}{dx} = 0$$

$$\frac{\partial M}{\partial y} = 4xy + 12xy^2$$

$$\frac{\partial N}{\partial x} = 4xy + 12xy^2$$

$$x\left(2y^2 + 4y^3 + 16x^2\right) + x\left(2xy + 6xy^2\right)\frac{dy}{dx} = 0$$

$$\underbrace{\left(2y^2 + 4y^3 + 16x^2\right)}_{MM} + \underbrace{\left(2xy + 6xy^2\right)}_{NN}\frac{dy}{dx} = 0$$

$$\frac{\partial MM}{\partial y} = 4y + 12y^2 \qquad \frac{\partial NN}{\partial x} = 2y + 6y^2$$

$$\frac{dy}{dx} + p(x)y = q(x) \quad \text{EDOL}(1)\text{cUNH}$$

$$y_{g/NH} = y_{g/H} + y_{p/q}$$

$$\frac{dy}{dx} + p(x)y = 0$$

$$\frac{dy}{dx} = -p(x)\cdot y$$

$$\int \frac{dy}{y} = -\int p(x)\,dx$$

$$\ln y + C_1 = -\int p\,dx + C_2$$

$$\ln y = -\int p\,dx + (C_2 - C_1)$$

$$\ln y = -\int p\,dx + C_{10}$$

$$y = e^{\left(-\int p\,dx + C_{10}\right)}$$

VS

$$y = e^{C_{10}} \cdot e^{-\int p(x)dx}$$

$$\boxed{y = C_1 e^{-\int p(x)dx}}$$

$$\underset{M}{p(x)y} + \underset{N}{\frac{dy}{dx}} = 0$$

$$\frac{\partial M}{\partial y} = p(x) \qquad \frac{\partial N}{\partial x} = 0$$

$$M + N\frac{dy}{dx} = 0 \quad \text{NO EXACTA}$$

H_i $\mu(x)$

$$\mu M + \mu N \frac{dy}{dx} = 0 \quad \text{EXACTA}$$

$$\frac{\partial}{\partial y}\mu M = \frac{\partial}{\partial x}\mu N$$

$$\mu\frac{\partial M}{\partial y} + M\frac{\partial \mu}{\partial y} = \mu\frac{\partial N}{\partial x} + N\frac{\partial \mu}{\partial x}$$

$$\mu\frac{\partial M}{\partial y} = \mu\frac{\partial N}{\partial x} + N\frac{d\mu}{dx}$$

$$N\frac{d\mu}{dx} = \mu\frac{\partial M}{\partial y} - \mu\frac{\partial N}{\partial x}$$

$$N\frac{d\mu}{dx} = \mu\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$$

$$\frac{d\mu}{\mu} = \left(\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}\right)dx$$

$$\frac{d\mu}{\mu} = \left(\frac{p(x) - 0}{1}\right)dx$$

$$\int\frac{d\mu}{\mu} = \int p(x)\,dx$$

$$\ell\mu = \int p(x)\,dx + (C_2 - C_1)$$

$$\mu = e^{\int p(x)dx}\cdot e^{C_2 - C_1}$$

$$\mu = Ce^{\int p(x)dx}$$

$$\frac{dy}{dx} + p(x)y = 0$$

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

$$MM = e^{\int p(x)dx}p(x)y$$

$$NN = e^{\int p(x)dx}$$

$$\frac{\partial MM}{\partial y} = e^{\int p(x)dx}p(x)$$

$$\frac{\partial NN}{\partial x} = e^{\int p(x)dx}p(x)$$

$$\frac{dy}{dx} + p(x)y = 0$$

$$e^{\int p(x)dx}\left(\frac{dy}{dx} + p(x)y\right) = 0$$

$$\frac{d}{dx}\left(ye^{\int p(x)dx}\right) = 0$$

$$ye^{\int p(x)dx} = C$$

$$y = Ce^{-\int p(x)dx}$$

$$\frac{dy}{dx} + p(x)y = q(x)$$

$$e^{\int p(x)dx}\left(\frac{dy}{dx} + p(x)y\right) = e^{\int p(x)dx} q(x)$$

$$\int \frac{d}{\,}\left(y e^{\int p(x)dx}\right) = \int e^{\int p(x)dx} q(x)\,dx$$

$$y e^{\int p(x)dx} = C + \int e^{\int p(x)dx} q(x)\,dx$$

$$y = Ce^{-\int p(x)dx} + e^{-\int p(x)dx}\int e^{\int p(x)dx} q(x)\,dx$$

$$y_{g/NH} = y_{g/H} + y_{p/q}$$