$$\overbrace{x^4 \ln x - 2xy^3}^{M} + \overbrace{3x^2y^2}^{N}\frac{dy}{dx} = 0$$

probar si es exacta

$$\frac{\partial M}{\partial y} = (0) - 6xy^2 \qquad \frac{\partial N}{\partial x} = 6xy^2$$

$$\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$$ NO_EXACTA.

EDO(1)NL $\longrightarrow M(x,y) + N(x,y)\frac{dy}{dx} = 0$

FACTOR INTEGRANTE $\mu(x)$

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

$$\frac{d\mu}{\mu} = \left(\frac{-6xy^2 - 6xy^2}{3x^2y^2}\right)dx$$

$$\frac{d\mu}{\mu} = \left(\frac{-12x\cancel{y^2}}{3x^2\cancel{y^2}}\right)dx$$

$$\frac{d\mu}{\mu} = \left(-\frac{4}{x}\right)dx$$

$$\int\frac{d\mu}{\mu} = -4\int\frac{dx}{x}$$

$$\ln\mu = -4\ln x$$

$$\ln\mu = \ln x^{-4}$$

$$\mu = x^{-4}$$

$$\boxed{\mu = \frac{1}{x^4}}$$

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

$$\mu = \frac{1}{x^4}$$

$$\frac{1}{x^4}\left(x^4 Lx - 2xy^3\right) + \frac{1}{x^4}\left(3x^2y^2\right)\frac{dy}{dx} = 0$$

$$\overbrace{Lx - \frac{2y^3}{x^3}}^{MM} + \overbrace{\left(\frac{3y^2}{x^2}\right)}^{NN}\frac{dy}{dx} = 0$$

$$\frac{\partial MM}{\partial y} = (0) - \frac{6y^2}{x^3} \qquad \frac{\partial NN}{\partial x} = -\frac{6y^2}{x^3}$$

$$\frac{\partial MM}{\partial y} = \frac{\partial NN}{\partial x} \quad \text{EXACTA}$$

$$\int M\,dx = \int Lx\,dx - 2y^3\int\frac{dx}{x^3}$$

$$= x(Lx - 1) - 2y^3\left(\frac{x^{-2}}{-2}\right)$$

$$\int M\,dx = x\,Lx - x + \frac{y^3}{x^2}$$

$$\frac{\partial}{\partial y}\int M\,dx = (0) + (0) + \frac{3y^2}{x^2}$$

$$NN - \frac{\partial}{\partial y}\int M\,dx = \frac{3y^2}{x^2} - \left(\frac{3y^2}{x^2}\right) \Rightarrow 0$$

SOLUCIÓN GENERAL $\boxed{x\,Lx - x + \frac{y^3}{x^2} = C_1}$

$$x^3 Lx - x^3 + y^3 = C_1 x^2$$

$$\boxed{\int M\,dx + \int\left(N - \frac{\partial}{\partial y}\int M\,dx\right)dy = C_1}$$

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

$$P(x) = 3e^x \qquad R(x) = (2-e^x)$$
$$Q(y) = \tan(y) \qquad S(y) = \sec^2(y)$$

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

$$-3\int\frac{-e^x dx}{2-e^x} + \int\frac{du}{u} = C_1$$

$$-3L(2-e^x) + L(\tan(y)) = C_1$$

$$L(2-e^x)^{-3} + L(\tan(y)) = C_1$$

$$L\left(\frac{\tan(y)}{(2-e^x)^3}\right) = C_1$$

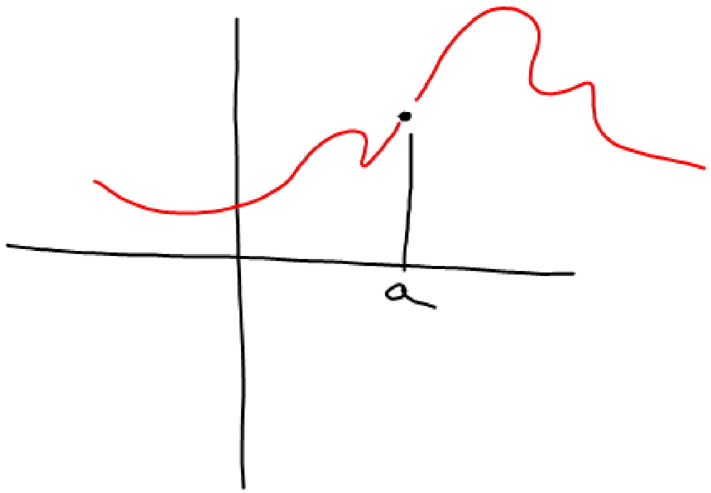
$$\frac{\tan(y)}{(2-e^x)^3} = e^{C_1}$$

$$\tan(y) = C_1(2-e^x)^3$$

$$y = \arctan\left(C_1(2-e^x)^3\right).$$

Teorema

Existencia y unicidad de la solución particular



Si

$$\frac{dy}{dx} = F(x,y) \quad \begin{cases} F \text{ existe y es continua } X_a \\ \frac{\partial F}{\partial y} \text{ existe y es continua } X_a \end{cases}$$

entonces en X_a
existirá una solución particular
y será única.

$$\frac{dy}{dx} = \frac{y}{x} \qquad x = 0$$

$$\frac{\partial F}{\partial y} = \frac{1}{x} \qquad x = 0$$

no hay una sol part. ó si la hay, no es única.

$$\int \frac{dy}{y} = \int \frac{dx}{x} \rightarrow Ly = Lx + LC_1$$

$$Ly = L(C_1 x)$$

$$\boxed{y = C_1 x}$$