Díaz Hernández Marcos Bryan
Ecuaciones Diferenciales
Participación

Resuelve la ecuación: $(1+\text{sen}(y))dx = [2y\cos(y) - x(\sec y + \tan y)]dy$

$(1+\text{sen}(y))dx + [\cancel{-2y}\cos(y) + x(\sec y + \tan(y))]\,dy = 0 \qquad y(0)=1$

$\frac{\partial M}{\partial y} = \cos(y) \quad \frac{\partial N}{\partial x} = +\sec(y) + \tan(y)$: no exacta

$$\alpha(y) = e^{\int \frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)dy}$$

$$= e^{\int \frac{1}{1+\text{sen}(y)}\left(+\sec(y) + \tan(y) - \cos(y)\right)dy}$$

$$= e^{\int \left(\frac{+\sec(y) + \tan(y) - \cos(y)}{1+\text{sen}(y)}\right)dy}$$

$$= e^{\int \frac{\left(\frac{1}{\cos(y)} + \frac{\text{sen}(y)}{\cos(y)} - \cos(y)\right)}{1+\text{sen}(y)}dy}$$

Integral $\displaystyle\int \frac{\frac{1+\text{sen}(y)}{\cos(y)}}{\frac{\cancel{1+\text{sen}(y)}}{1}}dy - \int\frac{\cos(y)}{1+\text{sen}(y)}dy$

$$= \int \frac{1}{\cos(y)}dy - \int \frac{\cos(y)}{1+\text{sen}(y)}dy \qquad \begin{aligned} v &= 1+\text{sen}(y) \\ dv &= \cos(y)\,dy \end{aligned}$$

$$= \int \sec(y)\,dy - \int \frac{dv}{v}$$

$$= \ln(\sec(y) + \tan(y)) - \ln(1+\text{sen}(y))$$

$$= \ln\left(\frac{\sec(y) + \tan(y)}{1+\text{sen}(y)}\right)$$

$$= e^{\ln\left(\frac{\sec(y)+\tan(y)}{1+\text{sen}(y)}\right)}$$

$$\alpha(y) = \frac{\sec(y) + \tan(y)}{1+\text{sen}(y)} = \alpha(y) = \frac{\frac{1+\text{sen}(y)}{\cos(y)}}{\cancel{1+\text{sen}(y)}} = \alpha(y) = \left(\frac{1}{\cos(y)}\right)$$

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$$\frac{\alpha(y)}{\alpha(y)}\left[M(x,y)\,dx + N(x,y)\,dy\right] = 0$$

$$\frac{1}{\cos(y)}\left((1+\operatorname{sen}(y))dx - [2y\cos(y) - x(\sec y + \tan y)]\,dy\right) = 0$$

$$\overbrace{\frac{1+\operatorname{sen}(y)}{\cos(y)}}dx - \overbrace{\left[\frac{2y\cos(y)}{\cos(y)} - \frac{x(\sec y + \tan y)}{\cos(y)}\right]}dy = 0$$

$$\frac{\partial M}{\partial y} = \frac{\cos(y)(\cos(y)) + (1+\operatorname{sen}(y))(\operatorname{sen}(y))}{\cos^2(y)} = \frac{\cos^2(y) + \operatorname{sen}^2(y) + \operatorname{sen}(y)}{\cos^2(y)}$$

$$= \frac{1+\operatorname{sen}(y)}{\cos^2(y)}$$

$$\frac{\partial N}{\partial x} = \frac{\sec y + \tan y}{\cos(y)} = \frac{\frac{1+\operatorname{sen}(y)}{\cos(y)}}{\frac{\cos(y)}{1}} = \frac{1+\operatorname{sen}(y)}{\cos^2(y)}$$ $\therefore$ son exactas

$$F(x,y) = C \Rightarrow dF = \cancel{C}^{0} \Rightarrow \frac{\partial F}{\partial x}dx + \frac{\partial F}{\partial y}dy = 0 \quad \begin{cases} \frac{\partial F}{\partial x} = M \\ \frac{\partial F}{\partial y} = N \end{cases}$$

$$\frac{dF}{dx} = M \Rightarrow \int dF = \int M\,dx$$

$$F = \int \left(\frac{1+\operatorname{sen}(y)}{\cos(y)}\right)dx + h(y)$$

$$F = x\left(\frac{1+\operatorname{sen}(y)}{\cos(y)}\right) + h(y) \ldots A)$$

$$\frac{dF}{dy} = x\left(\frac{\cos(y)(\cos(y)) + (1+\operatorname{sen}(y))(\operatorname{sen}(y))}{\cos^2(y)}\right)$$

$$\frac{dF}{dy} = x\left(\frac{\cos^2(y) + \operatorname{sen}^2(y) + \operatorname{sen}(y)}{\cos^2(y)}\right) = x\left(\frac{1+\operatorname{sen}(y)}{\cos^2(y)}\right) + h'(y)$$

$$-2y + x\left(\frac{\sec y + \tan y}{\cos(y)}\right) = x\left(\frac{1+\operatorname{sen}(y)}{\cos^2(y)}\right) + h'(y)$$

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$$-2y + \cancel{x\left(\frac{1+\operatorname{sen}(y)}{\cos^2(y)}\right)} = \cancel{x\left(\frac{1+\operatorname{sen}(y)}{\cos^2(y)}\right)} + h'(y)$$

$$-2y = h'(y)$$

$$\frac{dh}{dy} = -2y$$

$$\int dh = \int -2y \, dy$$

$$h = -y^2$$

en A) ...

$$\overset{C}{\cancel{F(x,y)}} = x\left(\frac{1+\operatorname{sen}(y)}{\cos(y)}\right) - y^2 + C$$

$$C = x\left(\frac{1+\operatorname{sen}(y)}{\cos(y)}\right) - y^2 \qquad \text{condicion } y(0)=1 \begin{cases} x=0 \\ y=1 \end{cases}$$

$$C = 0 - 1$$

$$C = -1$$

$$-1 = x\left(\frac{1+\operatorname{sen}(y)}{\cos(y)}\right) - y^2$$

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