Tarea Unidad 1 MM-411

Josué Ariel Izaguirre (20171034157)

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1.Resuelva las siguientes ecuaciones diferenciales:

a. $\boldsymbol{(1+x^2)\,\frac{dy}{dx} = (1+y)^2}$

Resolución por variables separables

$$(1+x^2)\frac{dy}{dx} = (1+y)^2 \tag{1}$$

$$[(1+x^2)\frac{dy}{dx} = (1+y)^2]dx(1+x^2)(1+y)^2 \tag{2}$$

$$\frac{dy}{(1+y)^2} = \frac{dx}{1+x^2} \tag{3}$$

$$\int \frac{dy}{(1+y)^2} = \int \frac{dx}{1+x^2} \tag{4}$$

$$-\frac{1}{1+y} + c_1 = \tan^{-1} x + c_2 \tag{5}$$

$$-\frac{1}{1+y} = \tan^{-1} x + c_3, \quad (c_3 = c_2 - c_1) \tag{6}$$

$$-1 - \tan^{-1} x - c_3 = y(\tan^{-1} x + c_3) \tag{7}$$

$$\boxed{y = -1 - \frac{1}{tan^{-1}x + c}}$$

b. $\boldsymbol{\frac{dy}{dx} = 6e^{2x-y}, y(0) = 0}$

$$[\frac{dy}{dx} = 6\frac{e^{2x}}{e^y}](e^y dx) \tag{1}$$
$$e^y dy = 6e^{2x} dx \tag{2}$$
$$\int e^y dy = \int 6e^{2x} dx \tag{3}$$
$$e^y = 3e^{2x} + c \tag{4}$$
$$y = Ln(3e^{2x} + c) \tag{5}$$

$$y(0) = 0 \tag{6.1}$$
$$0 = Ln(3e^{2(0)} + c) \tag{6.2}$$
$$1 = 3 + c \tag{6.3}$$
$$c = -2 \tag{6.4}$$

$$\boxed{y = Ln(3e^{2x} - 2)}$$

c. $\boldsymbol{xy' + y = 3xy, y(1) = 0}$

$$xy' = 3xy - y \tag{1}$$
$$y' = 3y - \frac{y}{x} \tag{2}$$
$$\frac{dy}{dx} = 3y - \frac{y}{x} \tag{3}$$
$$[\frac{dy}{dx} = 3y - \frac{y}{x}](\frac{dx}{y}) \tag{4}$$
$$\frac{dy}{y} = (3 - \frac{1}{x})dx \tag{5}$$
$$\int \frac{dy}{y} = \int (3 - \frac{1}{x})dx \tag{6}$$
$$ln(y) = 3x - ln(x) + c \tag{7}$$
$$\boxed{y = \frac{e^{3x+c}}{x}}$$