pertemuan 9 Kalkulus Lanjut

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1.) contoh 1 :

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

Jawab

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

$$\frac{dy}{dx}$$

2.) contoh 2

$$\frac{dy}{dx} = \frac{1}{xy}$$

Jawab

$$xy\,dy = 1\,dx$$

$$y\,dy = \frac{dx}{x}$$

$$\int y\,dy = \int \frac{1}{x}\,dx$$

$$\int y\,dy - \int \frac{1}{x}\,dx = 0$$

$$\int y\,dy - \int \frac{1}{x}\,dx = \int 0$$

$$\frac{1}{2}y^2 - \ln x = C$$

$$\frac{1}{2}y^2 = \ln x + C$$

$$y^2 = 2\ln x + C$$

$$y^2 = \sqrt{2\ln x + C}$$

3) contoh 3

$$x\,dx + y\,dy = 0$$

$$\int x\,dx + \int y\,dy = \int 0$$

$$\frac{1}{2}x^2 + \frac{1}{2}y^2 = C \quad \cdot 2$$

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

4) contoh 4

$$9yy' + 4x = 0$$

$$9y\frac{dy}{dx} + 4x = 0$$

$$9y\frac{dy}{dx} = -4x$$

$$9y\,dy = -4x\,dx$$

$$\int 9y\,dy = \int -4x\,dx$$

$$\frac{9}{2}y^2 + C_1 = \frac{-4}{2}x^2 + C_2$$

$$\frac{9}{2}y^2 + C_1 = -2x^2 + C_2 \quad \cdot 18$$

$$\frac{y^2}{4} + \frac{C_1}{18} = \frac{-x^2}{9} + \frac{C_2}{18}$$

$$\frac{y^2}{4} + \frac{x^2}{9} = C\,;\; C = \frac{C_2 - C_1}{18}$$

5) <u>contoh 5</u>.

$(1-y)y' = x^2$

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

$(1-y)\,dy = x^2\,dx$

$\int (1-y)\,dy = \int x^2\,dx$

$\int (1-y)\frac{d(1-y)}{-1} = \int x^2\,dx$

$-\frac{1}{2}(1-y)^2 + c_1 = \frac{1}{3}x^3 + c_2$

$-\frac{1}{2}(1-y)^2 - \frac{1}{3}x^3 = c_2 - c_1$. -6

$(1-y)^2 + x^3 = -6(c_2 - c_1)$

$(1-y)^2 + x^3 = c\,;\ c = -6(c_2 - c_1)$

6) <u>contoh 6</u>.

$2x\,dx - (y+1)\,dy = 0$

$2x\,dx = (y+1)\,dy$

$\int 2x\,dx = \int (y+1)\,dy$

$\frac{2}{2}x^2 + c_1 = \frac{1}{2}(y+1)^2 + c_2$

$x^2 + c_1 = \frac{1}{2}(y+1)^2 + c_2$

$x^2 - \frac{1}{2}(y+1)^2 = c_2 - c_1$. 2 .

$2x^2 - (y+1)^2 = 2(c_2 - c_1)$

$2x^2 - (y+1)^2 = c\,;\ c = 2(c_2 - c_1)$

7) Contoh 7

$$y\,dx + (1+x^2)\,dy = 0 \quad ; y \neq 0$$

$: y(1+x^2)$

$$\frac{1}{1+x^2}\,dx + \frac{1}{y}\,dy = 0$$

$$\int \frac{1}{1+x^2}\,dx + \int \frac{1}{y}\,dy = c$$

$$\arctan x + \ln y = c$$

8) contoh 8

$$2(y+3)\,dx - xy\,dy = 0$$

$\cdot \frac{1}{(y+3)x}$

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

$$\int \frac{2}{x}\,dx - \int \frac{y}{y+3}\,dy = \int 0$$

$$2\ln x - \int \left(\frac{y+3-3}{y+3}\right) dy = c$$

$$2\ln x - \int \frac{y+3}{y+3}\,dy + \int \frac{3}{y+3}\,dy = c.$$

$$2\ln x - y + \int \frac{3}{y+3}\,d\underbrace{(y+3)}_{1} = c.$$

$$2\ln x - y + 3\ln(y+3) = c$$

$$\ln x^2 - y + \ln(y+3)^3 = c$$

Soal 1

1) Bentuklah persamaan Deferensial dari fungsi :

$$y = x + \frac{A}{x}$$

Jawab :

$$\frac{dy}{dx} = 1 - Ax^{-2}$$

$$\frac{dy}{dx} = 1 - \frac{A}{x^2}$$

Jika $y = x + \frac{A}{x}$ maka $A = x\,(y - x)$

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

$$= 1 - \frac{(y-x)}{x} = \frac{x - (y-x)}{x} = \frac{2x-y}{x}$$

$$\frac{dy}{dx} = \frac{2x-y}{x} \quad \text{atau} \quad x\frac{dy}{dx} = 2x - y$$