

$$\ln x = a \rightarrow x = e^a$$

$$\int \frac{1}{x} dx = \int \left(\frac{1}{x} \right) dx = \ln(x)$$

Integration of $\frac{1}{x}$

$$\int dx = x \quad \int dt = t$$

Contoh soal (KASUS 3)

Carilah SOLUSI $x(t)$ dari persamaan diferensial biasa order pertama

$$\frac{dx(t)}{dt} = -2x(t) \quad x(0) = 10$$

First Order ODE kondisi awal

* Penyelesaian secara ANALITIK
(dengan KALKULUS)

$$\frac{dx(t)}{dt} = -2x(t)$$

$$\frac{dx(t)}{x(t)} = -2 dt = -2 \int dt$$

$$\ln [x(t)] = -2t + C$$

$$x(t) = e^{(-2t+C)} = e^C e^{-2t}$$

$$x(t) = A e^{-2t} \quad \text{solusi umum}$$

verifikasi:

$$\frac{dx(t)}{dt} = -2 A e^{-2t}$$

$$= -2 x(t) \rightarrow \text{check}$$

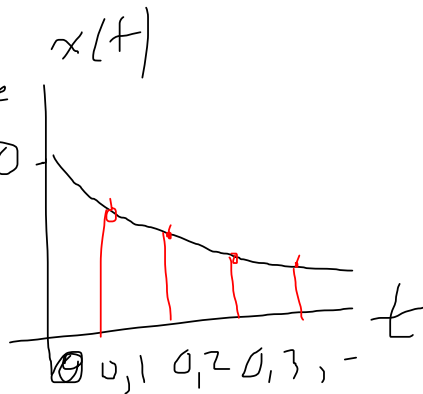
Untuk $t=0 \rightarrow x(0) = 10$

$$x(0) = A e^{-2 \cdot 0} = A e^0 = A = 10$$

Jadi SOLUSI ANALITIK:

$$x(t) = 10 e^{-2t}$$

exact



t	$x(t)$ exact
0	10
0,1	$10e^{-0,2} = 8,1873$
0,2	$10e^{-0,4} = 6,7032$
0,3	$10e^{-0,6} = 5,4881$
!	!
!	!

Solusi NUMERIK

Metode Numerik order Pertama

t	$x(t)$ NUMERIK
-----	----------------

$$0 \quad 10$$

$$0,1 \quad 8$$

$$0,2 \quad 6,4$$

$$0,3 \rightarrow x(0,3) = x(0,2) + 0,1 (-2x(0,2))$$

$$= 6,4 + 0,1 (-2 \cdot 6,4) = 6,4 - 1,28 = 5,12$$