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Komputasi Biomedis T2

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[1]:
```
#Contoh Soal

import numpy as np
import pandas as pd
from numpy import *
import pylab

# Input Data
x = np.array([0.0, 1.0, 2.0, 2.5, 3.0])
y = np.array([2.9, 3.7, 4.1, 4.4, 5.0])
n = len (x)

# Menghitung nilai xy dan x^2
xy = x * y
x_squared = x ** 2

# Menghitung nilai a dan b menggunakan regresi linier
mean_x = np.mean(x)
mean_y = np.mean(y)
b = np.sum((x - mean_x) * (y - mean_y)) / np.sum((x - mean_x) ** 2)
a = mean_y - b * mean_x
nilai_s = (y - a - b * x) ** 2

# Mengatur tampilan dataframe
data = {'No.': range(1, len(x) + 1), 'x': x, 'y': y, 'xy': xy, 'x^2':␣
↪x_squared,'s ke i' : nilai_s}
df = pd.DataFrame(data)

# Menghitung jumlah nilai s
S = np.sum(nilai_s)

# Menghitung jumlah x, jumlah y, jumlah xy, dan jumlah x^2
jumx=np.sum(x)
jumy=np.sum(y)
jumxy=np.sum(xy)
jumx_squared=np.sum(x_squared)
```

```
#C^-1.D
M = np.array([[n,jumx],[jumx,jumx_squared]])
N = np.array([[jumy],[jumxy]])
ab = np.dot(np.linalg.inv(M),N)
ybaru = zeros(n,float)
for i in range (0,n):
  ybaru[i] = ab[1]*x[i]+ab[0]


# Menampilkan nilai a dan b
print ('y = bX + a')
print("Bentuk Persamaan Regresi Liniernya adalah: f(x) = ",a,"+",b,"x" )
print("Nilai a:", a)
print("Nilai b:", b)
print('\n')

# Mendampilkan DataFrame
print('Tabel regresi linear dari data:')
print(df)
print("Jumlah X:", jumx)
print("Jumlah Y:", jumy)
print("Jumlah XY:", jumxy)
print("Jumlah X^2:", jumx_squared)
print('\n')

# Menampilkan nilai a, b dan S
print('Maka, ')
print("Nilai a:", a)
print("Nilai b:", b)
print("Nilai S:", S)
print('\n')

# Menampilkan grafik hasil regresi
print('Grafik plot data:')
pylab.plot(x,y,'og')
pylab.plot(x,ybaru,'-y')
print('Keterangan : Garis kuning = hasil regresi linear')
```

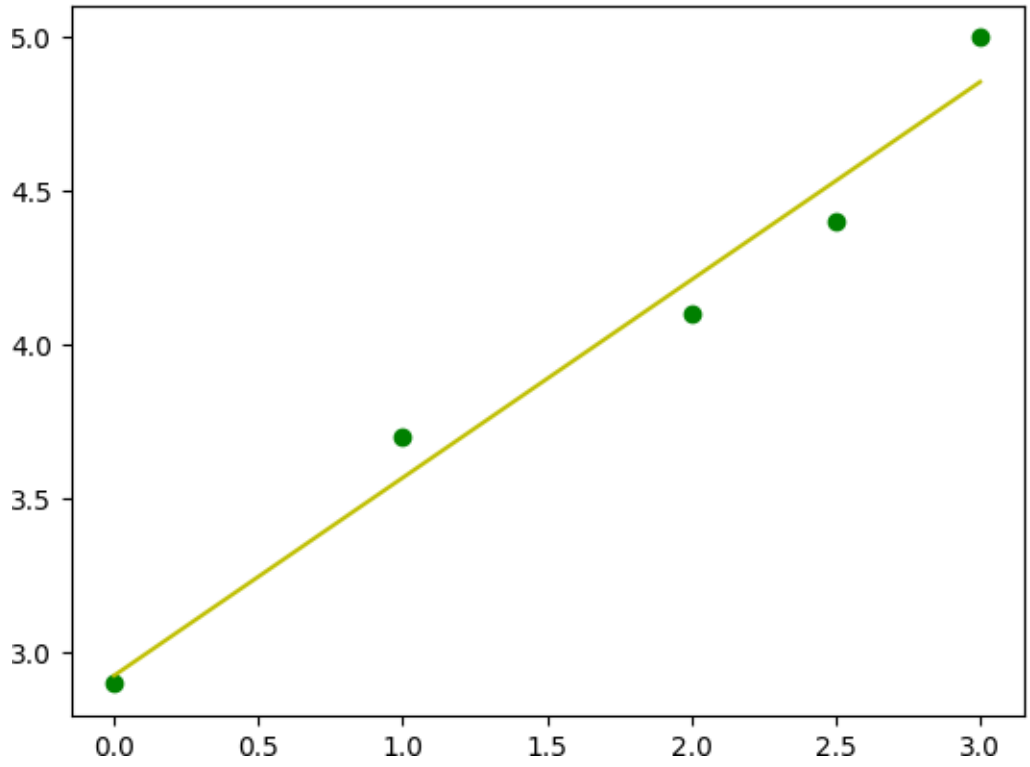
```
y = bX + a
Bentuk Persamaan Regresi Liniernya adalah: f(x) =  2.926724137931035 +
0.643103448275862 x
Nilai a: 2.926724137931035
Nilai b: 0.643103448275862


Tabel regresi linear dari data:
   No.    x    y    xy    x^2    s ke i
```

0	1	0.0	2.9	0.0	0.00	0.000714
1	2	1.0	3.7	3.7	1.00	0.016945
2	3	2.0	4.1	8.2	4.00	0.012753
3	4	2.5	4.4	11.0	6.25	0.018086
4	5	3.0	5.0	15.0	9.00	0.020726

Jumlah X: 8.5
Jumlah Y: 20.1
Jumlah XY: 37.9
Jumlah X^2: 20.25

Maka,
Nilai a: 2.926724137931035
Nilai b: 0.643103448275862
Nilai S: 0.06922413793103449

Grafik plot data:
Keterangan : Garis kuning = hasil regresi linear



[2]:
```
#Soal No  1
```

```
import numpy as np
import pandas as pd
from numpy import *
import pylab
import matplotlib.pyplot as plt
from scipy.stats import linregress

# Memasukkan data
x = np.array([0.5, 1.0, 1.5, 2.0, 2.5])
y = np.array([0.49, 1.60, 3.36, 6.44, 10.16])

# Menyesuaikan data dengan persamaan regresi linier
X = np.log(x)
Y = np.log(y)

# Menghitung nilai xy, y^2 dan x^2
XY = X * Y
X_squared = X ** 2
Y_squared = Y ** 2

# Menghitung nilai a dan b menggunakan regresi linier
mean_X = np.mean(X)
mean_Y = np.mean(Y)
b = np.sum((X - mean_X) * (Y - mean_Y)) / np.sum((X - mean_X) ** 2)
A = mean_Y - b * mean_X
a = np.exp(A)
nilai_s = (Y - A - b * X) ** 2

# Mengatur tampilan dataframe
data = {'No.': range(1, len(x) + 1), 'x': x, 'y': y, 'ln(x)': X, 'ln(y)': Y,
 ↪'ln(x)*ln(y)': XY, '(ln(x))^2': X_squared, '(ln(y))^2': Y_squared,'s ke i' :
 ↪nilai_s}
df = pd.DataFrame(data)

# Menghitung jumlah nilai s
S = np.sum(nilai_s)

# Menghitung jumlah x, jumlah y,jumlah ln(x), jumlah ln(y), jumlah ln(x)ln(y),
 ↪jumlah (lny)^2 dan jumlah (lnx)^2
jumx=np.sum(x)
jumy=np.sum(y)
jumX=np.sum(X)
jumY=np.sum(Y)
jumXY=np.sum(XY)
jumX_squared=np.sum(X_squared)
jumY_squared=np.sum(Y_squared)
```

```
# Menampilkan nilai a dan b
print ('Y = bX+A')
print ('ln(f(x))= b(ln(x))+ln(a)')
print("Bentuk Persamaan Regresi Liniernya adalah: ln(f(x)) = ",A,"+",b,"ln(x)" )
print("Nilai a:", a)
print("Nilai ln(a):", A)
print("Nilai b:", b)
print('\n')

# Mendampilkan DataFrame
print('Tabel regresi linear dari data:')
print(df)
print("Jumlah x:", jumx)
print("Jumlah y:", jumy)
print("Jumlah lnx:", jumX)
print("Jumlah lny:", jumY)
print("Jumlah ln(x)ln(y):", jumXY)
print("Jumlah (lnx)^2:", jumX_squared)
print("Jumlah (lny)^2:", jumY_squared)
print('\n')

# Menampilkan nilai a, b dan S
print('Maka, ')
print("Nilai a:", a)
print("Nilai b:", b)
print("Nilai ln(a):", A)
print("Nilai S:", S)
print('\n')

print('Grafik plot data:')

# Melakukan Plot Sebelum Linearisasi
plt.figure(figsize=(12, 4))
plt.subplot(131)
plt.scatter(x, y, label="Data Sebelum Linearisasi")
plt.xlabel("x")
plt.ylabel("y")
plt.legend()

# Melakukan Plot Sesudah Linearisasi
plt.subplot(132)
plt.scatter(X, Y, label="Data Sesudah Linearisasi")
plt.xlabel("ln(X)")
plt.ylabel("ln(Y)")
plt.legend()
```

```
# Melakukan Plot Hasil Regresi Linear
plt.subplot(133)
plt.scatter(X, Y, label="Data Linearisasi")
x_fit = np.linspace(min(X), max(X), 100)
y_fit = A + b * x_fit
plt.plot(x_fit, y_fit, color="red", label="Regresi Linier")
plt.xlabel("ln(x)")
plt.ylabel("ln(y)")
plt.legend()

plt.tight_layout()
plt.show()
```

Y = bX+A
ln(f(x))= b(ln(x))+ln(a)
Bentuk Persamaan Regresi Liniernya adalah: ln(f(x)) = 0.532473481198709 + 1.8817501813721564 ln(x)
Nilai a: 1.7031397871561753
Nilai ln(a): 0.532473481198709
Nilai b: 1.8817501813721564

Tabel regresi linear dari data:

	No.	x	y	ln(x)	ln(y)	ln(x)*ln(y)	(ln(x))^2	(ln(y))^2	\
0	1	0.5	0.49	-0.693147	-0.713350	0.494456	0.480453	0.508868	
1	2	1.0	1.60	0.000000	0.470004	0.000000	0.000000	0.220903	
2	3	1.5	3.36	0.405465	1.211941	0.491400	0.164402	1.468801	
3	4	2.0	6.44	0.693147	1.862529	1.291006	0.480453	3.469013	
4	5	2.5	10.16	0.916291	2.318458	2.124382	0.839589	5.375250	

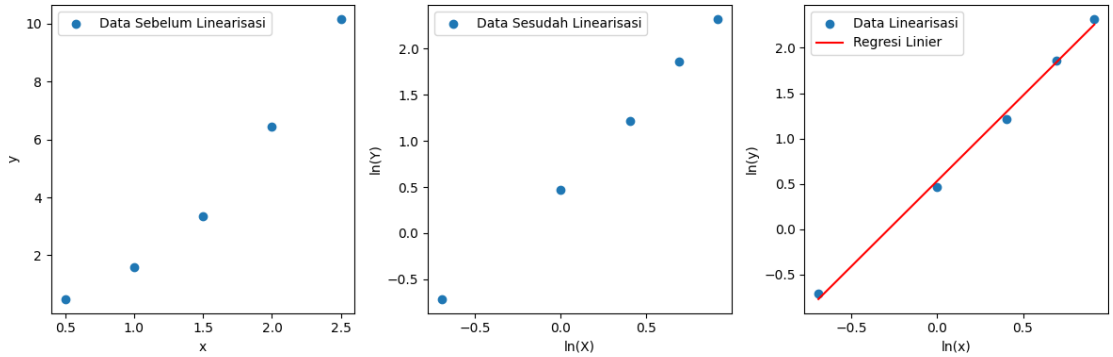
	s ke i
0	0.003423
1	0.003902
2	0.006975
3	0.000662
4	0.003814

Jumlah x: 7.5
Jumlah y: 22.05
Jumlah lnx: 1.3217558399823195
Jumlah lny: 5.149581697609982
Jumlah ln(x)ln(y): 4.401244630640314
Jumlah (lnx)^2: 1.9648966870480429
Jumlah (lny)^2: 11.042834509164479

Maka,
Nilai a: 1.7031397871561753

Nilai b: 1.8817501813721564
Nilai ln(a): 0.5324734811987O9
Nilai S: 0.018775933950291812

Grafik plot data:



[4]:
```
#Soal No 2
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

# Memasukkan data
t = np.array([0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5])
y = np.array([1.000, 0.994, 0.990, 0.985, 0.979, 0.977, 0.972, 0.969, 0.967, 0.
↪960, 0.956, 0.952])

# Menyesuaikan data dengan persamaan regresi linier
Y = np.log(y)

# Menghitung nilai ty, y^2, dan t^2
tY = t * Y
t_squared = t ** 2
Y_squared = Y ** 2

# Menghitung nilai a dan b menggunakan regresi linier
mean_t = np.mean(t)
mean_Y = np.mean(Y)
b = np.sum((t - mean_t) * (Y - mean_Y)) / np.sum((t - mean_t) ** 2)
A = mean_Y - b * mean_t
a = np.exp(A)
nilai_s = (Y - A - b * t) ** 2

# Mengatur tampilan dataframe
```

```
data = {'No.': range(1, len(t) + 1), 't': t, 'y': y, 'ln(y)': Y, 't*ln(y)': tY,
 ↪'t^2': t_squared, '(ln(y))^2': Y_squared, 's ke i': nilai_s}
df = pd.DataFrame(data)

# Menghitung jumlah nilai s
S = np.sum(nilai_s)

# Menghitung jumlah t, jumlah y, jumlah ln(y), jumlah tln(y), jumlah (ln(y))^2,
 ↪dan jumlah t^2
jumt = np.sum(t)
jumy = np.sum(y)
jumY = np.sum(Y)
jumtY = np.sum(tY)
jumt_squared = np.sum(t_squared)
jumY_squared = np.sum(Y_squared)

# Menampilkan nilai a dan b
print('Persamaan Regresi Linier: ln(y(t)) = {:.4f} - ({:.4f})t'.format(A, -b))
print("Nilai a:", a)
print("Nilai ln(a):", A)
print("Nilai b:", -b)
print('\n')

# Menampilkan DataFrame
print('Tabel regresi linear dari data:')
print(df)
print("Jumlah t:", jumt)
print("Jumlah y:", jumy)
print("Jumlah lny:", jumY)
print("Jumlah tln(y):", jumtY)
print("Jumlah t^2:", jumt_squared)
print("Jumlah (lny)^2:", jumY_squared)
print('\n')

# Menampilkan nilai a, b, dan S
print('Maka, ')
print("Nilai a:", a)
print("Nilai ln(a):", A)
print("Nilai b:", -b)
print("Nilai S:", S)
print('\n')

# Plot data dan hasil regresi
print('Grafik plot data:')
plt.scatter(t, Y, label="Data")
plt.plot(t, A - b * t, color="red", label="Regresi Linier")
plt.xlabel("t")
```

```
plt.ylabel("ln(y)")
plt.legend()
plt.show()
```

Persamaan Regresi Linier: ln(y(t)) = -0.0016 - (0.0086)t
Nilai a: 0.9984157812833949
Nilai ln(a): -0.0015854749179831755
Nilai b: 0.008639549701453635

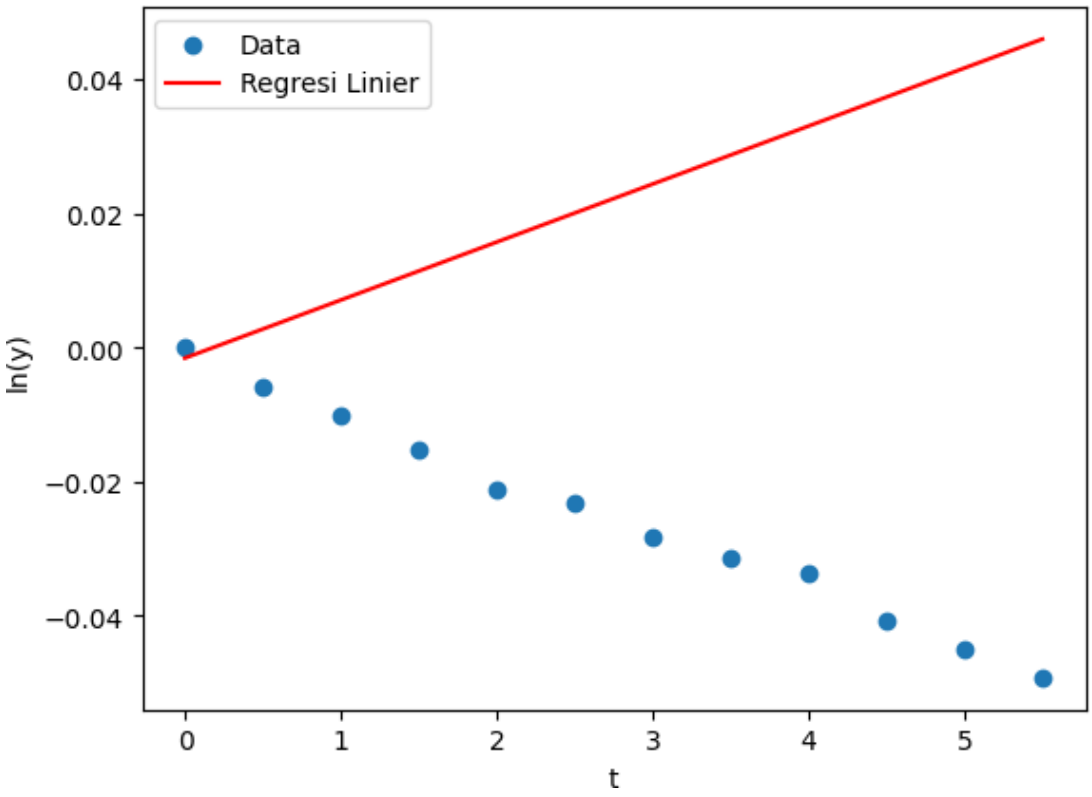
Tabel regresi linear dari data:

	No.	t	y	ln(y)	t*ln(y)	t^2	(ln(y))^2	s ke i
0	1	0.0	1.000	0.000000	0.000000	0.00	0.000000	2.513731e-06
1	2	0.5	0.994	-0.006018	-0.003009	0.25	0.000036	1.272893e-08
2	3	1.0	0.990	-0.010050	-0.010050	1.00	0.000101	3.051616e-08
3	4	1.5	0.985	-0.015114	-0.022670	2.25	0.000228	3.235771e-07
4	5	2.0	0.979	-0.021224	-0.042447	4.00	0.000450	5.565174e-06
5	6	2.5	0.977	-0.023269	-0.058172	6.25	0.000541	7.102742e-09
6	7	3.0	0.972	-0.028399	-0.085198	9.00	0.000807	8.016525e-07
7	8	3.5	0.969	-0.031491	-0.110217	12.25	0.000992	1.110434e-07
8	9	4.0	0.967	-0.033557	-0.134227	16.00	0.001126	6.692001e-06
9	10	4.5	0.960	-0.040822	-0.183699	20.25	0.001666	1.285552e-07
10	11	5.0	0.956	-0.044997	-0.224987	25.00	0.002025	4.585701e-08
11	12	5.5	0.952	-0.049190	-0.270546	30.25	0.002420	7.611850e-09

Jumlah t: 33.0
Jumlah y: 11.700999999999999
Jumlah lny: -0.30413083916376804
Jumlah tln(y): -1.1452237095273294
Jumlah t^2: 126.5
Jumlah (lny)^2: 0.010392648525644642

Maka,
Nilai a: 0.9984157812833949
Nilai ln(a): -0.0015854749179831755
Nilai b: 0.008639549701453635
Nilai S: 1.623955062084946e-05

Grafik plot data:


Data
Regresi Linier
0.04
0.02
0.00
−0.02
−0.04
ln(y)
0
1
2
3
4
5
t