Nama : Dimas Setiaji
NRP : 5025241056
Kelas : KomNum A

☀ Soal 2

⇒ Cari persamaan pangkat sederhana terhadap data berikut.

$y = ax^b$

x	2	3	4	5	6
y	4,84	6,47	7,92	9,26	10,52

x	y	$x_i = \log x$	$y_i = \log y$	$x_i * x_i$	$x_i * y_i$
2	4,84	0,30	0,69	0,09	0,21
3	6,47	0,48	0,81	0,23	0,39
4	7,92	0,60	0,90	0,36	0,54
5	9,26	0,70	0,97	0,49	0,68
6	10,52	0,78	1,02	0,61	0,80
Total		2,86	4,39	1,78	2,62

• $x_r = \dfrac{2,86}{(6-2)+1} = \dfrac{2,86}{5} = 0,57$ • $y_r = \dfrac{4,39}{(6-2)+1} = \dfrac{4,39}{5} = 0,88$

• $a_1 = \dfrac{n.(\sum x_i.y_i) - \sum x_i.\sum y_i}{n.(\sum x_i.x_i) - \sum x_i \sum x_i} = \dfrac{5.2,62 - 2,86.4,39}{5.1,78 - 2,86.2,86} = \dfrac{0,59}{0,72} = 0,75$

• $a_0 = y_r - a_1 * x_r$

$= 0,88 - (0,75.0,57)$

$= 0,45$

$\left.\begin{array}{l} \log y = \log a + b.\log x \\ y = a_0 + a_1.x \end{array}\right\}$ $a_0 = \log a \Leftrightarrow \boxed{a = 10^{0,45} = 2,82}$

$\boxed{b = a_1 = 0,75}$

⇒ Didapat, $y = ax^b \Leftrightarrow \boxed{y = 2,82x^{0,75}}$

\# Soal 1

▪ Cari persamaan pangkat sederhana terhadap data berikut :

$y = ae^{bx}$

x	2	3	4	5	6
y	3,58	4,37	5,39	6,52	7,97

x	y	$x_i = x$	$y_i = \ln y$	$x_i * x_i$	$x_i * y_i$
2	3,58	2	1,28	4	2,56
3	4,37	3	1,44	9	4,41
4	5,39	4	1,68	16	6,72
5	6,52	5	1,87	25	9,35
6	7,97	6	2,08	36	12,48
Total		20	8,38	90	35,52

∘ $X_r = \dfrac{20}{(6-2)+1} = \dfrac{20}{5} = 4$ • $Y_r = \dfrac{8,38}{(6-2)+1} = \dfrac{8,38}{5} = 1,68$

•) $a_1 = \dfrac{n.(\sum X_i Y_i) - \sum X_i \sum Y_i}{n.(\sum X_i X_i) - \sum X_i \sum X_i} = \dfrac{5 \cdot (35,52) - 20 \cdot 8,38}{5 \cdot (90) - 20 \cdot 20}$

$$= \dfrac{10}{50} = 0,2$$

•) $a_0 = Y_r - a_1 X_r = 1,68 - 0,2 \cdot 4 = 0,88$

$$\ln \underset{\underset{1}{}}{y} = \ln \underset{\underset{3}{}}{a} + \underset{\underset{2}{}}{b}x \quad \Bigg\} \quad a_0 = \ln a \Leftrightarrow a = e^{a_0} = e^{0,88} = 2,41$$

$$y = a_0 + a_1 x \qquad a_1 = b = 0,2$$

⟹ Didapat, $y = ae^{bx}$

$$\boxed{y = 2,41 e^{0,2x}}$$

* Regresi Polinomial

→ Cari persamaan polinomial berorde 2 terhadap tabel berikut:

$$Y = a_0 + a_1 + a_2 x^2 \qquad m = 2 \qquad n = 6$$

X_i	Y_i	X_i^2	X_i^3	X_i^4	$X_i Y_i$	$X_i^2 \cdot Y_i$
0	0	0	0	0	0	0
1	9	1	1	1	9	9
2	29	4	8	16	48	96
3	49	9	27	81	147	441
4	89	16	64	256	336	1344
5	129	25	125	625	645	3225
Σ 15	295	55	225	979	1185	5115

a) $X_r = \dfrac{15}{6} = 2{,}5$ b) $Y_r = \dfrac{295}{6} = 49{,}17$

→ Pers. simulasi untuk orde 2, yakni:

$$n \cdot a_0 + \Sigma X_i a_1 + \Sigma X_i^2 a_2 = \Sigma Y_i$$
$$\Sigma X_i a_0 + \Sigma X_i^2 a_1 + \Sigma X_i^3 a_2 = \Sigma X_i Y_i$$
$$\Sigma X_i^2 a_0 + \Sigma X_i^3 a_1 + \Sigma X_i^4 a_2 = \Sigma X_i^2 Y_i$$

⟹ Sehingga:

$$6 a_0 + 15 a_1 + 55 a_2 = 295$$
$$15 a_0 + 55 a_1 + 225 a_2 = 1185$$
$$55 a_0 + 225 a_1 + 979 a_2 = 5115$$

$\Big\}$? Cari $a_0, a_1, \& a_2$ dengan gauss-jordan

a) Iterasi 0 (Nilai Awal)

6	15	55	295
15	55	225	1185
55	225	979	5115

b) Iterasi 1 $R_1 = R_1/6$

①	2,50	9,17	49,17
15	55	225	1185
55	225	979	5115

c) Iterasi 2 $R_2 = R_2 - (15 \cdot R_1)$

1	2,50	9,17	49,17
⓪	17,50	87,45	447,45
55	225	979	5115

d) Iterasi 3 $R_3 = R_3 - (55 \cdot R_1)$

1	2,50	9,17	49,17
0	17,50	87,45	447,45
⓪	87,50	477,65	2910,65

o) Iterasi 4 $R_2 = R_2/17,5$

1	2,5	9,17	49,17
0	1	5	25,57
0	87,5	477,65	2410,65

o) Iterasi 6 $R_1 = R_1 - (2,5*R_2)$

1	0	-3,33	-14,57
0	1	5	25,57
0	0	37,15	173,28

o) Iterasi 8 $R_1 = R_1 - (-3,33*R_3)$

1	0	0	0,77
0	1	5	25,57
0	0	1	9,66

o) Iterasi 5 $R_3 = R_3 - (87,5*R_2)$

1	2,5	9,17	49,17
0	1	5	25,57
0	0	37,15	173,28

o) Iterasi 7 $R_3 = R_2/37,15$

1	0	-3,33	-14,57
0	1	5	25,57
0	0	1	9,66

o) Iterasi 9 $R_2 = R_2 - (5*R_3)$

1	0	0	0,77
0	1	0	2,127
0	0	1	9,86

→ Didapat $a_0 = 0,77$ $a_1 = 2,27$ $a_2 = 9,66$

Sehingga, $y = a_0 + a_1 x + a_2 x^2$

$$y = 0,77 + 2,27x + 9,66x^2$$