



**LABORATORIUM KIMIA FISIKA**  
Jurusan Kimia - FMIPA  
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# **MATEMATIKA KIMIA**

## **Fungsi dan Grafik**

(Sumber : Barrante, Applied Mathematics fo Physical Chemistry, Bab 2)

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# LATIHAN

1. Determine the zeros of the following functions:

(a)  $y = 5x - 5$

(b)  $3(y - 1) = -6x$

(c)  $y = x^2 - 2x - 8$

(d)  $y = 4x^2 - 3x - 1$

(e)  $y = x^2 - 3.464x + 3$

(f)  $y = \sin x$

(g)  $r = \cos \theta$

(h)  $\text{pH} = -\log_{10}(\text{H}^+)$

(i)  $x^2 + y^2 = 4$

(j)  $(x - 2)^2 + (y + 4)^2 = 9$

2. Plot the following functions in plane polar coordinates from 0 to  $2\pi$  (remember that in polar coordinates, negative values of  $r$  have no meaning):

(a)  $r = 3$

(b)  $r = \theta/36$

(c)  $r = 3 \sin \theta$

(d)  $r = 3 \cos \theta$

(e)  $r = 3 \sin \theta \cos \theta$

(f)  $r = 3 \cos^2 \theta - 1$

3. Plot the following functions in Cartesian coordinates:

(a)  $y = 4$

(b)  $y = 4x - 3$

(c)  $s = 3t^2$

(d)  $\psi = \sin \theta \quad (0 \text{ to } 2\pi)$

(e)  $y = -2x^2 + 4x + 4$

(f)  $y = (9 - x^2)^{1/2}$

(g)  $y = 4e^x$

(h)  $\psi = \sin \theta \cos \theta \quad (0 \text{ to } 2\pi)$

4. Plot the following functions choosing suitable coordinate axes:

(a)  $E_k = \frac{1}{2}mv^2$  (constant  $m$ )

(b)  $V = -e^2/r$  ( $e$  is a constant, not the exponential)

(c)  $F = e^2/r^2$  ( $e$  is a constant, not the exponential)

(d)  $[A] = [A]_0 e^{-kt}$  ( $[A]_0$  and  $k$  are constants;  $e$  is exponential)

(e)  $1/[A] = kt + C$  ( $k$  and  $C$  constants)

(f)  $k_r = Ae^{-E/RT}$  ( $E$ ,  $R$ , and  $A$  constants)



# LATIHAN

5. Plot the functions in Problem 4 choosing coordinates so that a straight line results.

6. Evaluate  $[f(x + h) - f(x)]/h$  for the following:

(a)  $f(x) = 1/x$

(c)  $f(x) = 4x^2 - 4$

(b)  $f(x) = 1/x^2$

(d)  $f(x) = 1/(1 + x)$

7. Radioactive decay is a first-order process in which the concentration of the radioactive material  $C$  is related to time  $t$  by the equation

$$C = C_0 e^{-kt}$$

where  $C_0$  and  $k$  are constants ( $e$  is the exponential). Given the following data, determine the values of  $C_0$  and  $k$  by plotting the data in such a way that a straight line results.

$t$	0	10	20	30	40	50	60	70
$C$	10	8.7	7.6	6.5	5.8	5.0	4.4	3.8

8. Using the graphical method, determine the roots of the following equations:

(a)  $y = x^3 + x^2 - 2x - 1$

(b)  $y = x^4 - 3x^2 + 1$

(c)  $y = x^4 + x^3 - 2.111x^2 - 2x + 0.111$

(d)  $y = x^6 - 6x^4 + 9x^2 - 4$



# KUNCI JAWABAN

1. (a)  $x = 1$   
(b)  $x = 0.5$   
(c)  $x = 4, -2$   
(d)  $x = 1, -0.25$   
(e)  $x = \sqrt{3}, \sqrt{3}$
6. (a)  $-\frac{1}{x(x+h)}$   
(b)  $\frac{-2x-h}{x^2(x^2+2xh+h^2)}$
7.  $C_0 = 2.30, k = 0.0138 \text{ time}^{-1}$
8. (a)  $x = 1.247, -1.802, -0.445$   
(b)  $x = \pm 0.618, \pm 1.618$   
(f)  $x = n\pi, n = 0, \pm 1, \pm 2, \dots$   
(g)  $\theta = (2n+1)\frac{\pi}{2}, n = 0, \pm 1, \pm 2, \dots$   
(h)  $(\text{H}^+) = 1.00M$   
(i)  $x = \pm 2$   
(j) none
- (c)  $4(2x+h)$   
(d)  $\frac{-1}{(1+x+h)(1+x)}$
- (c)  $x = 1.425, 0.053, -1.000, -1.479$   
(d)  $x = \pm 1, \pm 1, \pm 2$

