Latihan Bab 1

1. $\frac{7x^3y^{-4}z^{-6}}{84x^{-7}y^{-1}z^{-4}} = \frac{1}{12}x^{3-(-7)}y^{-4-(-1)}z^{-6-(-4)}$

$= \frac{x^{10}}{12y^3z^2}$

2. $\frac{24a^{-7}b^{-2}c}{6a^{-2}b^{-3}c^{-6}} = 4.a^{-7-(-2)}b^{-2-(-3)}c^{1-(-6)}$

$= \frac{4bc^7}{a^5}$

3. $\left(\frac{27a^{-5}b^{-3}}{3^5a^{-7}b^{-5}}\right)^{-1} = \frac{3^5a^{-7}b^{-5}}{27a^{-5}b^{-3}}$

$= \frac{9}{a^2b^2}$

4. $\frac{(5a^3b^{-2})^4}{(5a^{-4}b^{-5})^{-2}} = \frac{5^4a^{12}b^{-8}}{5^{-2}a^8b^{10}}$

$= 5^6a^4b^{-18}$

5. $a = 2+\sqrt{5}$

$b = 2-\sqrt{5}$

$a^2-b^2 = (a+b)(a-b)$

$= ((2+\sqrt{5})+(2-\sqrt{5}))((2+\sqrt{5})-(2-\sqrt{5}))$

$= 4.2\sqrt{5}$

$= 8\sqrt{5}$

6. $\frac{\sqrt{5}+2\sqrt{3}}{\sqrt{5}-3\sqrt{3}} = \frac{\sqrt{5}+2\sqrt{3}}{\sqrt{5}-3\sqrt{3}} \times \frac{\sqrt{5}+3\sqrt{3}}{\sqrt{5}+3\sqrt{3}}$

$= \frac{5+3\sqrt{15}+2\sqrt{15}+18}{5-27}$

$= \frac{23+5\sqrt{15}}{-22}$

7. $\frac{\sqrt{3}+3\sqrt{2}}{\sqrt{3}-6\sqrt{2}} = \frac{\sqrt{3}+3\sqrt{2}}{\sqrt{3}-6\sqrt{2}} \times \frac{\sqrt{3}+6\sqrt{2}}{\sqrt{3}+6\sqrt{2}}$

$= \frac{3+6\sqrt{6}+3\sqrt{6}+36}{3-72}$

$= \frac{39+9\sqrt{6}}{-69}$

$= \frac{13+3\sqrt{6}}{-23}$

8. $\frac{4(2+\sqrt{3})(2-\sqrt{3})}{(3+\sqrt{5})} \times \frac{3-\sqrt{5}}{3-\sqrt{5}}$

$= \frac{4(4-3)(3-\sqrt{5})}{9-5}$

$= 3-\sqrt{5}$

9. $\frac{6(3+\sqrt{5})(3-\sqrt{5})}{2+\sqrt{6}} \frac{2-\sqrt{6}}{2-\sqrt{6}}$

$= \frac{6(9-5)(2-\sqrt{6})}{4-6}$

$= -(24-12\sqrt{6})$

$= -24+12\sqrt{6}$

10. $\sqrt{12}+\sqrt{27}-\sqrt{3}$

$= \sqrt{4.3}+\sqrt{9.3}-\sqrt{3}$

$= 2\sqrt{3}+3\sqrt{3}-\sqrt{3}$

$= 4\sqrt{3}$

11. $\sqrt{8}+\sqrt{75}-(\sqrt{32}+\sqrt{243})$

$= \sqrt{4.2}+\sqrt{25.3}-\sqrt{16.2}-\sqrt{81.3}$

$= 2\sqrt{2}+5\sqrt{3}-4\sqrt{2}-9\sqrt{3}$

$= -2\sqrt{2}-4\sqrt{3}$

12. $(3\sqrt{2}-4\sqrt{3})(\sqrt{2}+\sqrt{3})$

$= 3.2+3\sqrt{6}-4\sqrt{6}-4.3$

$= -6-\sqrt{6}$

13. $\frac{24}{3-\sqrt{7}} \times \frac{3+\sqrt{7}}{3+\sqrt{7}}$

$= \frac{24(3+\sqrt{7})}{9-7}$

$= 12(3+\sqrt{7})$

$= 36 + 12\sqrt{7}$

14. $\sqrt{(a^{-1/3} b^{-1/2} c)^3}$

$= (a^{-1/3} b^{-1/2} c)^{3/2}$

$= a^{-1/2} b^{-3/4} c^{3/2}$

krn $a = 9 = 3^2$

$b = 16 = 2^4$

$c = 36 = 6^2$

maka :

$D = (3^2)^{-1/2} \cdot (2^4)^{-3/4} \cdot (6^2)^{3/2}$

$= \frac{1}{3} \cdot \frac{1}{8} \cdot 6^3$

$= 9$

15. $\frac{{}^3\log \sqrt{6}}{({}^3\log 18)^2 - ({}^3\log 2)^2}$

$= \frac{\frac{1}{2} \cdot {}^3\log 6}{({}^3\log 18 + {}^3\log 2)({}^3\log 18 - {}^3\log 2)}$

$= \frac{\frac{1}{2}\ {}^3\log 6}{{}^3\log 36 \cdot {}^3\log 9}$

$= \frac{\frac{1}{2}\ {}^3\log 6}{2 \cdot {}^3\log 6 \cdot 2}$

$= \frac{1}{8}$

16. $\frac{{}^{27}\log 9 + {}^2\log 3 \cdot {}^{\sqrt{3}}\log 4}{{}^3\log 2 - {}^3\log 18}$

$= \frac{{}^{27}\log 9 + {}^2\log 3 \cdot 2\ {}^3\log 4}{\cdot\ {}^3\log (2/18)}$

$= \frac{\frac{1}{3}\ {}^3\log 9 + 2 \cdot {}^2\log 4}{-1 \cdot {}^3\log 9}$

$= \frac{\frac{1}{3} \cdot 2 + 2 \cdot 2}{-1 \cdot 2}$

$= \frac{-14}{6}$

17. ${}^7\log 2 = a$

${}^2\log 3 = b$.

${}^6\log 14 = \frac{{}^2\log 14}{{}^2\log 6}$

$= \frac{{}^2\log 2 + {}^2\log 7}{{}^2\log 2 + {}^2\log 3}$

$= \frac{1 + \frac{1}{a}}{1 + b}$

$= \frac{a+1}{a(1+b)}$

Latihan bab 2

1. $P(x) = 2x^4 + ax^3 - 3x^2 + 5x + b$.

⇒ $P(x)$ dibagi $(x-1)$ sisa 11

$P(1) = 2 + a - 3 + 5 + b = 11$

$\Leftrightarrow a + b = 7$ .... (1)

⇒ $P(x)$ dibagi $(x+1)$ sisa -1

$P(-1) = 2 - a - 3 - 5 + b = -1$

$\Leftrightarrow -a + b = 5$ .... (2)

$a + b = 7$
$-a + b = 5$ (+)
$2b = 12$
$b = 6$

$b = 6 \rightarrow a = 1$

$\Rightarrow 2a + b = 2 \cdot 1 + 6 = 8$

2. $f(x) = ax^3 + 2x^2 + bx + 5$, $a \neq 0$

⇒ $f(x)$ dibagi $(x+1)$ sisa 4

$f(-1) = -a + 2 - b + 5 = 4$

$\Leftrightarrow a + b = 3$

⇒ $f(x)$ dibagi $(2x-1)$ sisa 4

$f(\frac{1}{2}) = \frac{a}{8} + \frac{1}{2} + \frac{b}{2} + 5 = 4$

$\Leftrightarrow a + 4b = -12$

$a + b = 3$
$a + 4b = -12$ (−)
$-3b = 15$
$b = -5$

$b = -5$

$a = 3 - (-5)$
$= 8$

$\Rightarrow a + 2b = 8 + 2(-5) = -2$

3. $P(x) = x^3 + ax^2 - 13x + b$.

⇒ $(x-2)$ adl faktor dr $P(x)$, shg

$P(2) = 8 + 4a - 26 + b = 0$

$\Leftrightarrow 4a + b = 18$

⇒ $(x-1)$ adl faktor dr $P(x)$, shg

$P(1) = 1 + a - 13 + b = 0$

$\Leftrightarrow a + b = 12$

$4a + b = 18$
$a + b = 12$ (−)
$3a = 6$
$a = 2$

$b = 12 - 2$
$= 10$

maka :

$P(x) = x^3 + 2x^2 - 13x + 10$

shg :

1	1	2	−13	10
		1	3	−10 (+)
	1	3	−10	0

2	1	3	−10
		2	10 (+)
	1	5	0

$P(x) = (x-1)(x-2)(x+5)$

didapat : $x_1 = 2$
$x_2 = 1$
$x_3 = -5$

$x_1 - x_2 - x_3 = 2 - 1 - (-5)$
$= 6$

4. $f(x) = x^3 + px^2 - 3x + q$

→ $(x+2)$ adl faktor dr $f(x)$, mk

$f(-2) = -8 + 4p + 6 + q = 0$

$\Leftrightarrow \quad 4p + q = 2$

→ $(x-3)$ adl faktor dr $f(x)$, maka

$f(3) = 27 + 9p - 9 + q = 0$

$\Leftrightarrow \quad 9p + q = -18$

$$\begin{array}{rl} 4p + q = 2 & \\ 9p + q = -18 & - \\ \hline -5p = 20 & \\ p = -4 & \end{array} \qquad \begin{array}{l} q = 2 + 16 \\ \quad = \text{HHH} \\ \quad = 18 \end{array}$$

diperoleh :

$f(x) = \text{HHH} - \text{HHH} + \text{HHH} - \text{HHH}$

$x^3 - 4x^2 - 3x + 18$

shg :

3	1	-4	-3	18
		3	HHH	-18
	1	-1	-6	0

-2	1	-1	-6
		-2	6
	1	-3	0

$f(x) = (x-3)(x+2)(x-3)$

$x_1 = 3$

$x_2 = 3$

$x_3 = -2$

$x_1 + x_2 + x_3 = 4$

5. $f(x) = 2x^3 + ax^2 + bx - 2$

→ $(x-2)$ adl faktor dr $f(x)$, mk

$f(2) = 16 + 4a + 2b - 2 = 0$

$\Leftrightarrow \quad 4a + 2b = -14$

$\Leftrightarrow \quad 2a + b = -7$

→ $f(x)$ dibagi $(x+3)$ sisa -50, mk

$f(-3) = -54 + 9a - 3b - 2 = -50$

$\Leftrightarrow \quad 9a - 3b = 6$

$\Leftrightarrow \quad 3a - b = 2$

$$\begin{array}{rl} 3a - b = 2 & \\ 2a + b = -7 & + \\ \hline 5a = -5 & \\ a = -1 & \end{array} \qquad \begin{array}{l} b = -7 - 2(-1) \\ \quad = -5 \end{array}$$

$\Rightarrow \quad a + b = -1 + (-5) = -6$

6. $f(x) = 2x^3 + ax^2 + bx + 2$

→ $f(x)$ dibagi $(x+1)$ sisa 6, mk

$f(-1) = -2 + a - b + 2 = 6$

$\Leftrightarrow \quad a - b = 6$

→ $f(x)$ dibagi $(x-2)$ sisa 24, mk

$f(2) = 16 + 4a + 2b + 2 = 24$

$\Leftrightarrow \quad 4a + 2b = 6$

$\Leftrightarrow \quad 2a + b = 3$

$$\begin{array}{rl} 2a + b = 3 & \\ a - b = 6 & + \\ \hline 3a = 9 & \\ a = 3 & \end{array} \qquad \begin{array}{l} b = 3 - 2(3) \\ \quad = 3 - 6 \\ \quad = -3 \end{array}$$

$\Rightarrow \quad 2a - b = 2 \cdot 3 - (-3)$

$= 9$

7. $f(x) : (x-1)$ sisa 4

$g(x) : (x-1)$ sisa 2

$f(x) : (x+3)$ sisa -5

$g(x) : (x+3)$ sisa 4

karena $h(x) = f(x) \cdot g(x)$

maka $h(x) : (x-1)$ sisa $4 \times 2 = 8$

dan $h(x) : (x+3)$ sisa $(-5) \times 4 = -20$

Menurut teo sisa :

$h(x) : [(x-1)(x+3)]$ mpy

sisa $ax + b$ dgn

$h(1) = a + b = 8$

$h(-3) = -3a + b = -20$

$$\begin{array}{rl} a + b &= 8 \\ -3a + b &= -20 \\ \hline 4a &= 28 \\ a &= 7 \end{array} \quad -$$

$b = 8 - 7$

$= 1$

Jadi, sisa dr $h(x)$ saat dibagi $x^2 + 2x - 3$ adl $7x + 1$