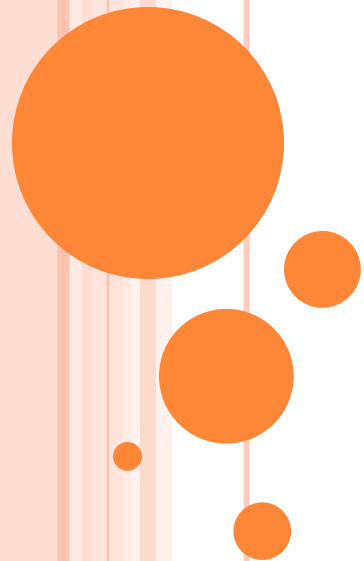


CHAPTER 3

Exponential and Logarithm Function (Fungsi Eksponensial dan Logaritma)



3.2 SURDS

○ The Operations of Surds

$$1). \sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$$

$$2). \frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

$$3). a\sqrt{c} + b\sqrt{c} = (a+b)\sqrt{c}$$

$$4). a\sqrt{c} - b\sqrt{c} = (a-b)\sqrt{c}$$

$$5). \sqrt{(a+b) + 2\sqrt{ab}} = \sqrt{a} + \sqrt{b}$$

$$6). \sqrt{(a+b) - 2\sqrt{ab}} = \sqrt{a} - \sqrt{b} \quad , a > b$$

$$7). \sqrt[n]{a^m} = a^{\frac{m}{n}}$$

$$8). \sqrt[m]{\sqrt[n]{a^k}} = a^{\frac{k}{m \times n}}$$


$$9). \sqrt{-1} = i$$

$i \Rightarrow \text{bilangan imajiner}$

○ Rationalizing The Denominator of A Surds Fraction

$$\text{Form: } \frac{a}{\sqrt{b}} \Rightarrow \frac{a}{\sqrt{b}} \times \frac{\sqrt{b}}{\sqrt{b}} = \frac{a\sqrt{b}}{b}$$

$$\text{Form: } \frac{a}{\sqrt{b} + \sqrt{c}} \Rightarrow \frac{a}{\sqrt{b} + \sqrt{c}} \times \frac{\sqrt{b} - \sqrt{c}}{\sqrt{b} - \sqrt{c}} = \frac{a(\sqrt{b} - \sqrt{c})}{b - c}$$

$$\text{Form: } \frac{a}{\sqrt{b} - \sqrt{c}} \Rightarrow \frac{a}{\sqrt{b} - \sqrt{c}} \times \frac{\sqrt{b} + \sqrt{c}}{\sqrt{b} + \sqrt{c}} = \frac{a(\sqrt{b} + \sqrt{c})}{b - c}$$


CONTOH 1:

Hitung dan sederhanakan bentuk akar berikut ini:

$$\text{a) } \sqrt{2} + 3\sqrt{2} + 5\sqrt{2} = (1 + 3 + 5)\sqrt{2} = 9\sqrt{2}$$

$$\text{b) } 5\sqrt{3} + 3\sqrt{3} - \sqrt{3} = (5 + 3 - 1)\sqrt{3} = 7\sqrt{3}$$

$$\begin{aligned} \text{c) } & 8\sqrt{3} + 6\sqrt{2} + 12\sqrt{3} - 4\sqrt{2} \\ &= (8 + 12)\sqrt{3} + (6 - 4)\sqrt{2} = 20\sqrt{3} + 2\sqrt{2} \end{aligned}$$



CONTOH 2:

Sederhanakan bentuk berikut:

a). $\frac{5}{\sqrt{2} + \sqrt{3}}$

Kali bentuk sekawan

$$= \frac{5}{\sqrt{2} + \sqrt{3}} \times \frac{\sqrt{2} - \sqrt{3}}{\sqrt{2} - \sqrt{3}} = \frac{5(\sqrt{2} - \sqrt{3})}{(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})}$$
$$= \frac{5\sqrt{2} - 5\sqrt{3}}{2 - 3} = \frac{5\sqrt{2} - 5\sqrt{3}}{-1} = 5\sqrt{3} - 5\sqrt{2}$$



b). $\frac{5}{\sqrt{2} - \sqrt{3}}$

Kali bentuk sekawan

$$= \frac{5}{\sqrt{2} - \sqrt{3}} \times \frac{\sqrt{2} + \sqrt{3}}{\sqrt{2} + \sqrt{3}} = \frac{5(\sqrt{2} + \sqrt{3})}{(\sqrt{2} - \sqrt{3})(\sqrt{2} + \sqrt{3})}$$

$$= \frac{5\sqrt{2} + 5\sqrt{3}}{2 - 3} = \frac{5\sqrt{2} + 5\sqrt{3}}{-1} = -5\sqrt{2} - 5\sqrt{3}$$



CONTOH 3:

Sederhanakan bentuk berikut:

$$\frac{7}{\sqrt{2} + \sqrt{3} - \sqrt{5}}$$

Pembahasan

$$\begin{aligned} \frac{7}{\sqrt{2} + \sqrt{3} - \sqrt{5}} &\times \frac{(\sqrt{2} + \sqrt{3} + \sqrt{5})}{(\sqrt{2} + \sqrt{3} + \sqrt{5})} = \frac{7\sqrt{2} + 7\sqrt{3} + 7\sqrt{5}}{2 + 3 + 2\sqrt{6} - 5} \\ &= \frac{7\sqrt{2} + 7\sqrt{3} + 7\sqrt{5}}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{7\sqrt{12} + 7\sqrt{18} + 7\sqrt{30}}{12} \\ &= \frac{14\sqrt{3} + 21\sqrt{2} + 7\sqrt{30}}{12} = \frac{7}{6}\sqrt{3} + \frac{7}{4}\sqrt{2} + \frac{7}{12}\sqrt{30} \end{aligned}$$

CONTOH 4:

$$\sqrt{5 + \sqrt{24}} = \dots\dots$$

INGAT: $\sqrt{(a+b) + 2\sqrt{ab}} = \sqrt{a} + \sqrt{b}$

$$\sqrt{5 + \sqrt{24}}$$

$$= \sqrt{5 + \sqrt{4 \times 6}} = \sqrt{5 + 2\sqrt{6}}$$

$$= \sqrt{(3 + 2) + 2\sqrt{3 \times 2}}$$

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

