PEMBAHASAN BENTUK PANGKAT DAN AKAR KELAS X

1. C

$$8^{-\frac{1}{3}}=\frac{1}{8^{\frac{1}{3}}}=\frac{1}{\sqrt[3]{8}}=\frac{1}{2}$$

2. C

$$7^{\frac{8}{6}}=7^{\frac{6}{6}+\frac{2}{6}}=7^{\frac{6}{6}}\times 7^{\frac{2}{6}}=7^{1}\times 7^{\frac{1}{3}}=7\times\sqrt[3]{7}=7\sqrt[3]{7}$$

3. B

$$\frac{1}{1+x^{p-q}}+\frac{1}{1+x^{q-p}}=\frac{1}{1+\frac{x^p}{x^q}}+\frac{1}{1+\frac{x^q}{x^p}}=\frac{1}{\frac{x^q}{x^q}+\frac{x^p}{x^q}}+\frac{1}{\frac{x^p}{x^p}+\frac{x^q}{x^p}}=\frac{1}{\frac{x^q+x^p}{x^q}}+\frac{1}{\frac{x^q+x^p}{x^p}}$$

$$=\frac{x^q}{x^q+x^p}+\frac{x^p}{x^q+x^p}=\frac{x^q+x^p}{x^q+x^p}=1$$

4. A

$$\frac{(x+y)^{3a+1}}{(x+y)^{2a+5}}=(x+y)^{3a+1-(2a+5)}=(x+y)^{3a+1-2a-5}=(x+y)^{a-4}$$

5. B

$$\left(\frac{a^2b}{c^2}\right)^3\times\frac{b^4}{ac^3}=\left(\frac{a^{2\times 3}b^3}{c^{2\times 3}}\right)\times\frac{b^4}{ac^3}=\frac{a^6}{a}\times\frac{b^3\times b^4}{1}\times\frac{1}{c^6\times c^3}$$

$$=a^{6-1}\times b^{3+4}\times\frac{1}{c^{6+3}}=\frac{a^5b^7}{c^9}$$

6. B

$$\left(3^x+3^{-x}\right)^2=(6)^2$$
$$\left(3^x\right)^2+2\left(3^x\right)\left(3^{-x}\right)+\left(3^{-x}\right)^2=36$$
$$\left(3^2\right)^x+2+\left(3^2\right)^{-x}=36$$
$$9^x+2+9^{-x}=36$$
$$9^x+9^{-x}=36-2$$
$$9^x+9^{-x}=34$$

7. D

$$\left(\frac{3}{3^{x-2}}\right)^2=\sqrt[3]{\frac{1}{9}}\Leftrightarrow\frac{(3)^2}{\left(3^{x-2}\right)^2}=\left(\frac{1}{9}\right)^{\frac{1}{3}}\Leftrightarrow\frac{9}{3^{2x-4}}=\left(\frac{1}{3^2}\right)^{\frac{1}{3}}\Leftrightarrow\frac{3^2}{3^{2x-4}}=\frac{1}{3^{\frac{2}{3}}}\Leftrightarrow 3^{2-(2x-4)}=3^{-\frac{2}{3}}$$

$$\Leftrightarrow 3^{2-2x+4}=3^{-\frac{2}{3}}\Leftrightarrow 3^{6-2x}=3^{-\frac{2}{3}}$$

$$6-2x=-\frac{2}{3}$$

$$-2x=-\frac{2}{3}-6$$

$$-2x=\frac{-2-18}{3}$$

$$-2x=\frac{-20}{3}$$

$$x=\frac{-20}{-6}$$

$$x=3\frac{1}{3}$$

8. D

$$\frac{\sqrt[3]{\left(8^{\frac{1}{3}}\right)^9}}{\left(\sqrt[3]{2}\right)^6}=\frac{\left(\left(8^{\frac{1}{3}}\right)^9\right)^{\frac{1}{3}}}{\left(2^{\frac{1}{3}}\right)^6}=\frac{8^{\frac{9}{9}}}{2^{\frac{6}{3}}}=\frac{8}{2^2}=\frac{8}{4}=2$$

9. B

$$\sqrt[3]{\sqrt[2]{\frac{27}{8}}}=\sqrt[3]{\left(\sqrt[2]{\frac{27}{8}}\right)}=\sqrt[3]{\left(\frac{27}{8}\right)^{\frac{1}{2}}}=\left(\left(\frac{27}{8}\right)^{\frac{1}{2}}\right)^{\frac{1}{3}}=\left(\frac{27}{8}\right)^{\frac{1}{2}\times\frac{1}{3}}=\left(\frac{27}{8}\right)^{\frac{1}{3}\times\frac{1}{2}}$$

$$=\left(\left(\frac{27}{8}\right)^{\frac{1}{3}}\right)^{\frac{1}{2}}=\left(\sqrt[3]{\left(\frac{27}{8}\right)}\right)^{\frac{1}{2}}=\left(\frac{3}{2}\right)^{\frac{1}{2}}=\frac{\sqrt{3}}{\sqrt{2}}$$

$$\frac{\sqrt{3}}{\sqrt{2}}=\frac{\sqrt{3}}{\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}=\frac{\sqrt{6}}{\sqrt{4}}=\frac{\sqrt{6}}{2}=\frac{1}{2}\sqrt{6}$$

10. A

$$\left(a^{\frac{1}{2}}-a^{-\frac{1}{2}}\right)^2\left(a^{\frac{1}{2}}+a^{-\frac{1}{2}}\right)^2=\left[\left(a^{\frac{1}{2}}-a^{-\frac{1}{2}}\right)\left(a^{\frac{1}{2}}+a^{-\frac{1}{2}}\right)\right]^2=\left[\left(a^{\frac{1}{2}}\right)^2-\left(a^{-\frac{1}{2}}\right)^2\right]^2$$
$$=\left(a^1-a^{-1}\right)^2=\left(a-\frac{1}{a}\right)^2=(a)^2-2(a)\left(\frac{1}{a}\right)+\left(\frac{1}{a}\right)^2$$
$$=a^2-2+\frac{1}{a^2}=\frac{a^4-2a^2+1}{a^2}$$
$$=\frac{1}{a^2}\left(a^2-1\right)^2$$

11. B

$$p^2-2=\left(1+\sqrt{3}\right)^2-2=\left[\left(1^2\right)+2(1)\left(\sqrt{3}\right)+\left(\sqrt{3}\right)^2\right]-2$$
$$=\left(1+2\sqrt{3}+3\right)-2$$
$$=4+2\sqrt{3}-2=2+2\sqrt{3}=2\left(1+\sqrt{3}\right)=2\,p$$

12. B

$$f(x)f(y)=f(x+y)$$
$$a^x\cdot a^y=a^{x+y}$$
$$a^{x+y}=a^{x+y}$$

13. A

$$\left(-z^5u^5\right)^3=\left(-z^5u^5\right)\times\left(-z^5u^5\right)\times\left(-z^5u^5\right)=-z^{15}u^{15}$$

14. C

$$\left(\frac{x^2}{y^3}\right)^6:\left(\frac{y^6}{x^{-4}}\right)^{-3}=\left(\frac{x^{12}}{y^{18}}\right):\left(\frac{y^{-18}}{x^{12}}\right)=\left(\frac{x^{12}}{y^{18}}\right)\times\left(\frac{x^{12}}{y^{-18}}\right)=\frac{x^{12+12}}{y^{18-18}}=\frac{x^{24}}{y^0}=x^{24}$$

15. E

$$\frac{\sqrt{0,0036}}{0,3}=\frac{\sqrt{\frac{36}{10000}}}{\frac{3}{10}}=\frac{\frac{6}{100}}{\frac{3}{10}}=\frac{6}{100}\times\frac{10}{3}=\frac{2}{10}=0,2$$

16. D

$$8^{2x-1}=\sqrt{4^{2x+3}}$$
$$\left(2^3\right)^{2x-1}=\left(4^{2x+3}\right)^{\frac{1}{2}}$$
$$2^{3(2x-1)}=4^{\frac{1}{2}(2x+3)}$$
$$2^{6x-3}=\left(2^2\right)^{\frac{1}{2}(2x+3)}$$
$$2^{6x-3}=(2)^{1(2x+3)}$$
$$2^{6x-3}=2^{2x+3}$$
$$6x-3=2x+3$$
$$6x-2x=3+3$$
$$4x=6$$
$$x=\frac{6}{4}=1\frac{2}{4}=1\frac{1}{2}$$

17. E

$$\sqrt{3\sqrt{9\sqrt{27}}}=3^{\frac{x}{y}}\Leftrightarrow\sqrt{3\sqrt{9\times\left(27\right)^{\frac{1}{2}}}}=3^{\frac{x}{y}}\Leftrightarrow\sqrt{3\times\left(3^2\times\left(3^3\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}}=3^{\frac{x}{y}}$$
$$\Leftrightarrow\left(3\times\left(3^2\times\left(3^3\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}\Leftrightarrow\left(3\times\left(3^2\times3^{\frac{3}{2}}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}$$
$$\Leftrightarrow\left(3\times\left(3^{2+\frac{3}{2}}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}\Leftrightarrow\left(3\times\left(3^{\frac{7}{2}}\right)^{\frac{1}{2}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}\Leftrightarrow\left(3\times3^{\frac{7}{4}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}$$
$$\Leftrightarrow\left(3^{1+\frac{7}{4}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}\Leftrightarrow\left(3^{\frac{11}{4}}\right)^{\frac{1}{2}}=3^{\frac{x}{y}}\Leftrightarrow3^{\frac{11}{8}}=3^{\frac{x}{y}}$$
$$x=11$$
$$y=8$$
$$x+y=19$$

18. A

$$\frac{5^{2-n}-(0,2)^n}{5^{1-n}+(0,2)^n}=\frac{5^{2-n}-\left(\frac{1}{5}\right)^n}{5^{1-n}+\left(\frac{1}{5}\right)^n}=\frac{5^2\cdot\frac{1}{5^n}-\frac{1}{5^n}}{5^1\cdot\frac{1}{5^n}+\frac{1}{5^n}}=\frac{25\cdot\frac{1}{5^n}-\frac{1}{5^n}}{5\cdot\frac{1}{5^n}+\frac{1}{5^n}}=\frac{24\cdot\frac{1}{5^n}}{6\cdot\frac{1}{5^n}}=\frac{24}{6}=4$$

19. A

$5^{2x+1}-6\cdot5^{x}+1=0$
$5^{2x}\cdot5^{1}-6\cdot5^{x}+1=0$
$5\cdot\left(5^{x}\right)^{2}-6\cdot5^{x}+1=0$

Misalkan $5^{x}=a$
$5a^{2}-6a+1=0$
$(5a-1)(a-1)=0$
$5a-1=0 \quad \vee \quad a-1=0$
$5a=1 \qquad a=1$
$a=\frac{1}{5} \qquad 5^{x}=1$
$5^{x}=\frac{1}{5} \qquad x=0$
$x=-1$

20. A

$9^{3x}-2\cdot3^{3x+1}-27=0$
$\left(3^{2}\right)^{3x}-2\cdot3^{3x}\cdot3^{1}-27=0$
$\left(3^{3x}\right)^{2}-6\cdot3^{3x}-27=0$

Misalkan $3^{3x}=a$
$a^{2}-6a-27=0$
$(a-9)(a+3)=0$
$a-9=0 \quad \vee \quad a+3=0$
$a=9 \qquad a=-3$
$3^{3x}=3^{2} \qquad 3^{3x}=-3$
$3x=2 \qquad x=\textit{tidak ada}$
$x=\frac{2}{3}$

21. E

$\left(2^{-\frac{6}{5}}\right)^{3}=2^{-\frac{18}{5}}=\frac{1}{2^{\frac{18}{5}}}=\frac{1}{2^{3\frac{3}{5}}}=\frac{1}{2^{3}\times2^{\frac{3}{5}}}=\frac{1}{8}\times\frac{1}{\sqrt[5]{8}}$

22. A

$\frac{3\sqrt{5}\times5\sqrt{5}}{25}=\frac{3\times5\times\sqrt{5}\times\sqrt{5}}{25}=\frac{3\times5\times5}{25}=3$

23. A

$$\frac{\sqrt{10}-\sqrt{5}}{\sqrt{5}}=\frac{\sqrt{10}}{\sqrt{5}}-\frac{\sqrt{5}}{\sqrt{5}}=\sqrt{\frac{10}{5}}-1=\sqrt{2}-1=-1+\sqrt{2}$$

24. D

$$\frac{5}{3\sqrt{2}-\sqrt{3}}=\frac{5}{3\sqrt{2}-\sqrt{3}}\times\frac{3\sqrt{2}+\sqrt{3}}{3\sqrt{2}+\sqrt{3}}=\frac{5\left(3\sqrt{2}+\sqrt{3}\right)}{\left(3\sqrt{2}\right)^2-\left(\sqrt{3}\right)^2}=\frac{15\sqrt{2}+5\sqrt{3}}{18-3}=\frac{15\sqrt{2}+5\sqrt{3}}{15}$$
$$=\frac{15\sqrt{2}}{15}+\frac{5\sqrt{3}}{15}=\sqrt{2}+\frac{\sqrt{3}}{3}=\sqrt{2}+\frac{1}{3}\sqrt{3}$$

25. A

$$\sqrt{18}+\sqrt{50}-\sqrt{72}=\sqrt{9\cdot2}+\sqrt{25\cdot2}-\sqrt{36\cdot2}=3\sqrt{2}+5\sqrt{2}-6\sqrt{2}=2\sqrt{2}$$

26. A

$$\begin{aligned}\sqrt{31+\sqrt{936}}-\sqrt{21-\sqrt{416}}&=\sqrt{31+\sqrt{4\times234}}-\sqrt{21-\sqrt{4\times104}}\\&=\sqrt{31+2\sqrt{234}}-\sqrt{21-2\sqrt{104}}\\&=\sqrt{(18+13)+2\sqrt{(18\times13)}}-\sqrt{(13+8)-2\sqrt{(13\times8)}}\\&=\left(\sqrt{18}+\sqrt{13}\right)-\left(\sqrt{13}-\sqrt{8}\right)\\&=\sqrt{18}+\sqrt{8}\\&=\sqrt{9\times2}+\sqrt{4\times2}\\&=3\sqrt{2}+2\sqrt{2}=5\sqrt{2}\end{aligned}$$

27. B

$$\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}=\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}}\times\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}-\sqrt{3}}=\frac{\left(\sqrt{2}\right)^2-2\left(\sqrt{2}\right)\left(\sqrt{3}\right)+\left(\sqrt{3}\right)^2}{\left(\sqrt{2}\right)^2-\left(\sqrt{3}\right)^2}=\frac{2-2\sqrt{6}+3}{2-3}=\frac{5-2\sqrt{6}}{-1}$$
$$=-5+2\sqrt{6}$$

$a=-5$

$b=2$

$a+b=-5+2=-3$

28. A

$$\sqrt[m]{\sqrt[n]{a^p}}=\left(\sqrt[n]{a^p}\right)^{\frac{1}{m}}=\left(\left(a^p\right)^{\frac{1}{n}}\right)^{\frac{1}{m}}=a^{\frac{p}{mn}}$$

29. B

$$\begin{aligned}(m-7\sqrt{2})(m+7\sqrt{2}) &= m^2-(7\sqrt{2})^2 = m^2-98 = (\sqrt{18}+\sqrt{80})^2-98\\ &= (\sqrt{9\cdot 2}+\sqrt{16\cdot 5})^2-98 = (3\sqrt{2}+4\sqrt{5})^2-98\\ &= (3\sqrt{2})^2+2(3\sqrt{2})(4\sqrt{5})+(4\sqrt{5})^2-98\\ &= 18+24\sqrt{10}+80-98\\ &= 24\sqrt{10}\end{aligned}$$

30. C

$$\begin{aligned}2\sqrt{8}+\sqrt{18}+\frac{1}{4}\sqrt{32}+\sqrt{200} &= 2\sqrt{4\cdot 2}+\sqrt{9\cdot 2}+\frac{1}{4}\sqrt{16\cdot 2}+\sqrt{100\cdot 2}\\ &= 4\sqrt{2}+3\sqrt{2}+\sqrt{2}+10\sqrt{2} = 18\sqrt{2}\end{aligned}$$

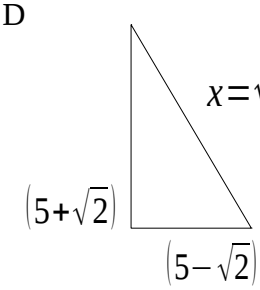
31. C

$$\sqrt[3]{49\cdot\sqrt[3]{49\cdot\sqrt[3]{49\cdot\overset{3}{\cdots}}}} = a \Leftrightarrow 49\cdot\sqrt[3]{49\cdot\sqrt[3]{49\cdot\overset{3}{\cdots}}} = a^3 \Leftrightarrow 49\cdot a = a^3 \Leftrightarrow 49 = a^2 \Leftrightarrow 7 = a$$

32. D

$$\frac{3\sqrt{24}-2\sqrt{18}}{-\sqrt{2}} = \frac{3\sqrt{24}}{-\sqrt{2}}-\frac{2\sqrt{18}}{-\sqrt{2}} = -3\sqrt{\frac{24}{2}}+2\sqrt{\frac{18}{2}} = -3\sqrt{12}+2\sqrt{9} = -3\sqrt{4\cdot 3}+2\cdot 3 = -6\sqrt{3}+6$$

33. D



$$\begin{aligned}x &= \sqrt{(5+\sqrt{2})^2+(5-\sqrt{2})^2} = \sqrt{(25+10\sqrt{2}+2)+(25-10\sqrt{2}+2)}\\ &= \sqrt{25+25+10\sqrt{2}-10\sqrt{2}+2+2}\\ &= \sqrt{54} = \sqrt{9\times 6} = 3\sqrt{6}\end{aligned}$$

Keliling = $(5+\sqrt{2})+(5-\sqrt{2})+3\sqrt{6} = 10+3\sqrt{6}$ cm

34. E

$L=4\pi r^2$

$$\begin{aligned}L &= 4\cdot\pi\cdot(2\sqrt{2}+\sqrt{6})^2\\ &= 4\cdot\pi\cdot\left[(2\sqrt{2})^2+2(2\sqrt{2})(\sqrt{6})+(\sqrt{6})^2\right]\\ &= 4\cdot\pi\cdot(8+8\sqrt{3}+6)\\ &= 4\cdot\pi\cdot(14+8\sqrt{3}) = (56+32\sqrt{3})\pi\ cm^2\end{aligned}$$

35. B

$$\frac{f(x+3)}{f(x-1)}=\frac{2^{x+3}}{2^{x-1}}=\frac{2^x\cdot 2^3}{\frac{2^x}{2^1}}=2^x\cdot 2^3\times\frac{2^1}{2^x}=2^3\cdot 2^1=2^4=f(4)$$

36. D

$$\left(\frac{3}{3^{x-2}}\right)^2=\sqrt[3]{\frac{1}{9}}$$
$$\left(\frac{3^2}{3^{2(x-2)}}\right)=\left(\frac{1}{9}\right)^{\frac{1}{3}}$$
$$\frac{3^2}{3^{2x-4}}=\left(3^{-2}\right)^{\frac{1}{3}}$$
$$3^{2-2x+4}=3^{-\frac{2}{3}}$$
$$6-2x=-\frac{2}{3}$$
$$18-6x=-2$$
$$-6x=-20$$
$$x=\frac{20}{6}=\frac{10}{3}$$

37. B

$$3^{x+3}=\sqrt[5]{27^{x-5}}$$
$$3^{x+3}=\left(27^{x-5}\right)^{\frac{1}{5}}$$
$$3^{x+3}=3^{3(x-5)\times\frac{1}{5}}$$
$$3^{x+3}=3^{\frac{3}{5}(x-5)}$$
$$x+3=\frac{3}{5}(x-5)$$
$$5x+15=3x-15$$
$$5x-3x=-15-15$$
$$2x=-30$$
$$x=-15$$

38. D

$$(0,25)^{x+4}=\sqrt{8^{2x-5}}$$
$$\left(\frac{1}{4}\right)^{x+4}=\left(8^{2x-5}\right)^{\frac{1}{2}}$$
$$\left(4^{-1}\right)^{x+4}=\left(2^{3(2x-5)}\right)^{\frac{1}{2}}$$
$$2^{-2(x+4)}=\left(2^{6x-15}\right)^{\frac{1}{2}}$$
$$2^{-2x-8}=2^{3x-\frac{15}{2}}$$
$$-2x-8=3x-\frac{15}{2}$$
$$-4x-16=6x-15$$
$$-4x-6x=-15+16$$
$$-10x=1$$
$$x=-\frac{1}{10}=-0,1$$

39. A

$$\sqrt{108}-\frac{2}{3-\sqrt{27}}=\sqrt{36\times 3}-\left(\frac{2}{3-\sqrt{27}}\times\frac{3+\sqrt{27}}{3+\sqrt{27}}\right)=6\sqrt{3}-\left(\frac{6+2\sqrt{27}}{9-27}\right)=6\sqrt{3}-\left(\frac{6+2\sqrt{27}}{-18}\right)$$
$$=6\sqrt{3}-\left(\frac{6}{-18}+\frac{2\sqrt{27}}{-18}\right)=6\sqrt{3}+\frac{1}{3}+\frac{1}{9}\sqrt{9\cdot 3}=6\sqrt{3}+\frac{1}{3}+\frac{1}{9}\sqrt{9\cdot 3}$$
$$=6\sqrt{3}+\frac{1}{3}+\frac{1}{3}\sqrt{3}=\frac{19\sqrt{3}+1}{3}$$

40. C

$$\frac{\left(3p^{-2}q^{3}\right)^{-2}}{\left(3^{2}p^{-1}q^{2}\right)^{-3}}=\frac{\left(3^{2}p^{-1}q^{2}\right)^{3}}{\left(3p^{-2}q^{3}\right)^{2}}=\frac{3^{2\times 3}p^{-1\times 3}q^{2\times 3}}{3^{1\times 2}p^{-2\times 2}q^{3\times 2}}=\frac{3^{6}p^{-3}q^{6}}{3^{2}p^{-4}q^{6}}=3^{6-2}p^{-3-(-4)}q^{6-6}=3^{4}p=81p$$