Basic Mathematics: Section 3

Laws of Indices

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1. $a^m \cdot a^n = a^{m+n}$
2. $\dfrac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $(ab)^n = a^n b^n$
5. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$
6. $a^0 = 1$, for $a \neq 0$
7. $a^{-n} = \dfrac{1}{a^n}$
8. $a^{1/n} = \sqrt[n]{a}$
9. $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$
10. $\sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$
11. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$
12. $\left(\dfrac{a}{b}\right)^{-n} = \left(\dfrac{b}{a}\right)^n$
13. If $a^x = a^y$, then $x = y$.
14. If $b^x = c^x$, then $b = c$ (for $x \neq 0$).

Question:1

Find the value of x in the equation:

$$27^{2x-1} = (243)^3$$

Question:2

Simplify the expression:

$$(64)^{-2/3} \times \left(\frac{1}{4}\right)^{-2} \times 8^{0} \times (256)^{-1/4} \times 8^{2/3}$$

Question:3

Find the value of the expression

$$\frac{p^1 + p^2 + p^3 + p^4 + p^5 + p^6 + p^7}{p^{-3} + p^{-4} + p^{-5} + p^{-6} + p^{-7} + p^{-8} + p^{-9}}$$

Question:4

Simplify the expression

$$\frac{(243)^{n/5} \times 3^{2n+1}}{9^n \times 3^{n-1}}$$

Question:5

Simplify the expression

$$\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}} \times \left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}} \times \left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}}$$

Question:6

Simplify the expression

$$\frac{(2x^2y^{-1})^3 \times (4x^{-1}y^3)^{-2}}{(8x^{-3}y^2)^2}$$

Question:7

Find the real solutions for x

$$4^x - 6 \cdot 2^x + 8 = 0$$

Question:8

Find the real solutions for x

$$9^{x+1} - 28 \cdot 3^x + 3 = 0$$

Question:9

If $2^x = 3^y = 6^{-z}$, then find the value of:

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$$

Question:10

If $a^x = b^y = c^z$ and $abc = 1$, find the value of:

$$xy + yz + zx$$