Algebra And Number - AN3 - Exponent Laws Continued

Proving Exponent Laws Continued

1. $\boldsymbol{a^0 = 1,\ a \neq 0}$

Proof:

$$\begin{aligned} a^0 &= a^{m-m} \\ &= \frac{a^m}{a^m} \\ &= 1 \end{aligned}$$

2. $\boldsymbol{a^{-n} = \frac{1}{a^n},\ a \neq 0}$

Proof:

$$\begin{aligned} a^{-n} &= a^{0-n} \\ &= \frac{a^0}{a^n} \\ &= \frac{1}{a^n} \end{aligned}$$

Exponents $\Leftrightarrow$ Radicals

1. **Does $\boldsymbol{\sqrt[n]{a} = a^{\frac{1}{n}}}$?**

n	a	$\sqrt[n]{a}$	$a^{\frac{1}{n}}$
2	4	$\sqrt[2]{4} = 2$	$4^{\frac{1}{2}} = (2^2)^{\frac{1}{2}} = 2^{\frac{2}{2}} = 2$
2	9		
2	16		
3	27	$\sqrt[3]{27} = 3$	$27^{\frac{1}{3}} = (3^3)^{\frac{1}{3}} = 3^{\frac{3}{3}} = 3$
3	8		
5	a^5		
2	5		

Proof: Proving This Law Is Left As A **Challenge Exercise**

Practice

1. **Express Each Radical As An Exponential: Radical $\Rightarrow$ Exponential**:

i. $\sqrt[2]{5}$ ii. $\sqrt[4]{\kappa^7}$ iii. $\sqrt[4]{\kappa^{41}\kappa^{23}}$ iv. $\sqrt[8]{\alpha^{10}\alpha^2}$

1. **Express Each Exponent As A Radical: Exponential ⇒ Radical**:

i. $\alpha^{\frac{1}{2}}$ iii. $\gamma^{\frac{5}{3}}$ v. $\beta^{\frac{9}{2}}$ vii. $\phi^{\frac{\heartsuit}{4}}$

ii. $\beta^{\frac{3}{2}}$ iv. $\psi^{\frac{4}{n}}$ vi. $m^{\frac{1}{4}}m^{\frac{1}{4}}$ viii. $\left(\frac{\sigma^{10}}{\sigma^4}\right)^{\frac{1}{3}}$

Combining The Exponent Laws

We have now covered every exponent law we will need for this course. What remains is to tackle problems that involve a variety of different laws. This section will focus on **mastering** the laws.

Practice

Simplify Each Of The Following. Express Answer in **Exponential Form**:

A) $(\alpha^4\alpha^7)^2$ G) $(2\phi^{\frac{\heartsuit}{4}})^2$ M) $\sqrt[2]{\beta^{\frac{10}{5}}}$ S) $(\gamma^{\frac{5}{3}})^6\gamma^4$

B) $\left(\frac{\gamma^7\alpha^3}{\alpha^2}\right)^2$ H) $\left(\frac{2(\flat^4)^3}{\flat^4\gamma^2}\right)^2$ N) $\left(\frac{2(\psi^{543})^2}{\kappa^\pi\gamma^2}\right)^0$ T) $\left(\frac{\beta^{50}}{\beta^{25}}\right)^{\frac{1}{5}} \cdot \beta^{17}$

C) $((\beta^8\chi^3)^2)^2$ I) $2(\alpha^7 \div \beta^4)^{\frac{1}{2}}$ O) $(\alpha^{\frac{1}{2}}\beta\sqrt[2]{\sigma})^2$ U) $(\alpha^{\frac{1}{2}} \div \alpha^{\frac{1}{2}})^\pi$

D) $\left(\frac{\heartsuit^{20}}{\heartsuit^5}\right)^{\frac{1}{2}}$ J) $(\sqrt[3]{\alpha})^5\alpha^2$ P) $(\sqrt[4]{m}m^{\frac{1}{4}})^4$ V) $\beta^{\frac{3}{2}} \times \beta^{\frac{3}{2}} \div \beta^{\frac{3}{2}}$

E) $(\kappa^{\frac{1}{2}}\kappa^4)^2$ K) $\gamma^{\frac{5}{3}}\gamma^2\sqrt[2]{\gamma}$ Q) $(\sigma^2\sigma^4)^2(\sigma^2\sigma^4)^5$ W) $\left(\sqrt[5]{\gamma^{\frac{5}{3}}}\right)^6$

F) $\left(\frac{\mho^{18}\mho^6}{\mho^4}\right)^{\frac{1}{2}}$ L) $\frac{(\sqrt[n]{\kappa^5})^n}{\kappa^2\kappa^4}$ R) $(\heartsuit^{\frac{3}{2}})^3\sqrt[2]{\heartsuit}$ X) $\left(\frac{x^{10}}{\sigma^4}\right)^{\frac{1}{3}}$

For The Remainder Of Class Work On D2L Quizzes
