

4.4 - Fractional Exponents

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Exponent Law Review:

"power" $\left[\begin{array}{l} X^n \end{array} \right] \rightarrow$ "exponent"
 $\left[\begin{array}{l} X \end{array} \right] \rightarrow$ "base"

① $X^n \cdot X^m = X^{m+n}$

ex: $2^2 \cdot 2^5 = 2^{2+5} = 2^7$

② $\frac{X^n}{X^m} = X^{n-m}$

ex: $\frac{8^9}{8^7} = 8^{9-7} = 8^2$

③ $(X^n)^m = X^{m \cdot n}$

ex: $(5^2)^4 = 5^{(2)(4)} = 5^8$

④ $(X \cdot Y)^n = X^n Y^n$

ex: $(2 \cdot 3)^6 = 2^6 \cdot 3^6$

New exponent Laws:

$$\textcircled{1} X^{-n} = \frac{1}{X^n}$$

$$\text{ex: } 3^{-2} = \frac{1}{3^2}, \text{ also, } \frac{1}{5^{-3}} = 5^3$$

$$\textcircled{2} X^{m/n} = \sqrt[n]{X^m}$$

$$\text{ex: } 3^{1/2} = \sqrt[2]{3^1} = \sqrt{3}$$

$$\text{ex: } 7^{4/3} = \sqrt[3]{7^4}$$

Example: Evaluate w/o a calculator:

$$27^{1/3} = \sqrt[3]{27^1} = \sqrt[3]{27} = \sqrt[3]{3 \cdot 3 \cdot 3} = 3$$

$$(3)^{-2} = \frac{1}{3^2} = \frac{1}{9} = 0.\bar{1}$$

$$\left(\frac{4}{9}\right)^{-1/2} = \left(\frac{9}{4}\right)^{1/2} = \sqrt{\left(\frac{9}{4}\right)^1} = \sqrt{\frac{9}{4}} = \frac{\sqrt{9}}{\sqrt{4}} = \boxed{\frac{3}{2}}$$

$$27^{4/3} = \sqrt[3]{27^4} = \left[\sqrt[3]{27}\right]^4 = [3]^4 = \boxed{81}$$

In general: $X^{\frac{m}{n}}$
m → exponent
n → index

HW: Pg. 227 # 3-6, 10-12,
15, 16.