3.3 notes

Friday, September 25, 2020 1:15 PM

Foundations and Precalculus 10

3.3 – Fractional Exponents

A. Use a calculator to complete the tables.

x	$x^{\frac{1}{2}}$
1	$1^{1/2} = 1$
4	$4^{1/2} = 2$
9	$9^{1/2} = 3$
16	$= 4$
25	$= 5$

$\sqrt{x}$

x	$x^{\frac{1}{3}}$
1	$1^{1/3} = 1$
8	$8^{1/3} = 2$
27	$27^{1/3} = 3$
64	$= 4$
125	$= 5$

$\sqrt[3]{x}$

Notice the pattern:

$\sqrt{x}$ the square root in exponential form is $x^{\frac{1}{2}}$

$\sqrt[3]{x}$ the cube root in exponential form is $x^{\frac{1}{3}}$

$\sqrt[5]{x}$ the fifth root in exponential form is $x^{\frac{1}{5}}$

where do the 1 go?

IN GENERAL, $x^{\frac{1}{n}}$ as a radical becomes $\sqrt[n]{x}$. And vice versa, $\sqrt[n]{x}$ equals $x^{\frac{1}{n}}$.

Ex #1: Write as a radical and then evaluate.

a) $1000^{\frac{1}{3}}$ (exponent, index)

$= \sqrt[3]{1000}^{1}$

$= (10)^{1}$

$= 10$

b) $0.25^{\frac{1}{2}}$

* when no index visible, assume square root.

$= \sqrt[2]{0.25}^{1}$

$= \sqrt{0.25}$

$= 0.5$

c) $\left(\frac{16}{81}\right)^{\frac{1}{4}}$

$= \sqrt[4]{\frac{16}{81}}$

$= \frac{\sqrt[4]{16}}{\sqrt[4]{81}}$

$= \frac{2}{3}$

$\sqrt[x]{\frac{a}{b}} = \frac{\sqrt[x]{a}}{\sqrt[x]{b}}$

or $\sqrt{\frac{9}{25}} = \frac{\sqrt{9}}{\sqrt{25}} = \frac{3}{5}$

* no visible exponent is actually a 1.

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In a fractional exponent,

$x^{\frac{m}{n}}$ ← *Exponent of the root or radicand*
← *Index of the root (little #)*
so $x^{\frac{m}{n}} = \sqrt[n]{x^m}$ or $\left(\sqrt[n]{x}\right)^m$

Ex#2: Write $32^{\frac{2}{5}}$ in radical form **two** ways.

a) $\sqrt[5]{32^2}$
$= \sqrt[5]{1024}$
$= 4$

b) $\left(\sqrt[5]{32}\right)^2$
$= (2)^2$
$= 4$

* smaller numbers so easier to evaluate.

To help remember: Flower power ; hat ; boots

Ex#3: Write in exponent form.

a) $\sqrt{3^5} = 3^{\frac{5}{2}}$

b) $\left(\sqrt[3]{25}\right)^2 = 25^{\frac{2}{3}}$

base, numerator, denominator, index, radicand, exponent

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

Ex#4: Write in radical form and then evaluate.

brackets not necessary under √

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

b) $81^{\frac{3}{4}}$
$= \left(\sqrt[4]{81}\right)^3$
$= (3)^3$
$= 27$

c) $(-27)^{\frac{4}{3}}$
$= \left(\sqrt[3]{(-27)}\right)^4$
$= (-3)^4$
$= 81$

d) $(-32)^{0.4}$
$= (-32)^{\frac{2}{5}}$
$= \left(\sqrt[5]{-32}\right)^2$
$= (-2)^2$
$= 4$

$0.4 = \frac{4}{10} = \frac{2}{5}$

HW p227 #3-7,12,17