Algebra II - Notes

Alg II
T6-4
Notes
1-29-14

1-29-14 T 6-4 **n^{th} Roots**

* Simpeifying expressions by adding, subtracting, multiplying and dividing

$\boxed{\text{index}} \rightarrow \sqrt[n]{81}$ ← $\boxed{\text{radical sign}}$

$\boxed{\text{radicand}}$

Square root → $\sqrt[2]{}$ ← index

review

$\sqrt[2]{81}$ → rewrite as $\sqrt[2]{9^2}$

$X^{10} = X^5 \cdot X^5 = X^2 X^8$

$(X^2)^5 = X^{10}$

odd

$(-5)^{101}$ → negative #

$(-5)^{100}$ → positive #

even

<u>If</u> → n odd

- one real root $\sqrt[3]{}$
- absolute values never needed

<u>If</u> n even

- If you have an even root of even power <u>and</u> you end up with an odd power... You must use absolute value around odd power to show it has to be positive

EX: $\sqrt[2]{X^{10}} = |X^5|$

What is:

$\sqrt[2]{16} = \sqrt[2]{4^2} = 4$

$\sqrt[2]{81} = \sqrt[2]{9^2} = 9$

$\sqrt[2]{32} = \sqrt[2]{16} \cdot \sqrt[2]{2} = \sqrt[2]{4^2} \cdot \sqrt{2} = 4\sqrt{2}$

2 16

What is:

$\sqrt[4]{16} = \sqrt[4]{2^4} = 2$

16: 2 8; 8: 2 4; 4: 2 2

$\sqrt[4]{81} = \sqrt[4]{3^4} = 3$

81: 9 9; 9: 3 3; 9: 3 3

index & exponent cancel if they are the same

What is: Even

ODD

$\sqrt[4]{16x^4} = \sqrt[4]{2^4 \cdot x^4} = 2x^1 = 2|x|$

ODD - Do Not need to worry about Absolute Value Sign

$\sqrt[5]{243x^{10}} = \sqrt[5]{3^5 x^{10}} = \sqrt[5]{3^5 x^5 x^5} = 3xx = \boxed{3x^2}$

$x^5 x^5 = x^{10}$

or $\sqrt[5]{3^5 (x^2)^5} = \boxed{3x^2}$

or $\sqrt[5]{3^5 x^{10}} = 3^1 x^2$

$5 \div 5 = 1 \quad 10 \div 5 = 2$

even　　even　　ODD

$$\pm\sqrt[2]{36x^{10}} = \pm\sqrt[2]{6^2x^{10}} = \pm 6|x^5|$$

– absolute value sign

even　　even　　even

$$-\sqrt[2]{(y+7)^{16}} = -(y+7)^{8}$$

no absolute value sign

$16 \div 2 = 8$

even　　even　　odd

$$\sqrt[4]{x^{12}} = x^{3} = \boxed{|x^3|}$$

← absolute value sign

exponent ÷ index → $12 \div 4 = 3$

$$\sqrt[3]{27x^{27}} = \sqrt[3]{3^3x^{27}} = \boxed{3x^9}$$

$27 \div 3 = 9$

$$\sqrt[5]{x^{50}} = \boxed{x^{10}}$$

$50 \div 5$

$$\sqrt[5]{x^{27}} = \sqrt[5]{x^{25}x^2} = \sqrt[5]{x^{25}} \cdot \sqrt[5]{x^2} = \boxed{x^5\sqrt[5]{x^2}}$$

$25 \div 5 = 5$

What is:

$$\sqrt[5]{243a^{20}b^{25}} = \sqrt[5]{243} \cdot \sqrt[5]{a^{20}} \cdot \sqrt{b^{25}} =$$

$$\sqrt[5]{3^5} \cdot \sqrt[5]{a^{20}} \cdot \sqrt[5]{b^{25}} = \boxed{3a^4b^5}$$

$20 \div 5 = 4$　　$25 \div 5 = 5$

$$\sqrt[6]{64(x^2-3)^{18}} = \sqrt[6]{64} \cdot \sqrt[6]{(x^2-3)^{18}} =$$

$$\sqrt[6]{2^6} \cdot \sqrt[6]{(x^2-3)^{18}} = \boxed{2|(x^2-3)^3|}$$

$18 \div 6 = 3$

even $\qquad$ even $\qquad$ odd

$$\sqrt[2]{36y^6} = \sqrt[2]{36}\,\sqrt{y^6} = \sqrt[2]{6^2 \cdot y^3} = 6|y^3|$$

$6 \div 2 = 3$

use absolute value

$$\sqrt[4]{16(x-3)^{12}} = \sqrt[4]{16} \cdot \sqrt[4]{(x-3)^{12}} =$$

Use calculator to approximate the value to the three decimal places =

$\sqrt[2]{58} \approx 7.616 \qquad 58^{\frac{1}{2}}$

$-\sqrt[2]{76} \approx -8.718 \qquad -76^{\frac{1}{2}}$

$\sqrt[5]{-43} \approx -2.122 \qquad (-43)^{\frac{1}{5}}$

$\sqrt[4]{71} \approx 71^{\frac{1}{4}} = 2.903$

6.5 Operations with Radicals - Part I

Adding and Subtracting Radicals:

$x^2 + x^2 = 2x^2$ Like Terms only

$2x^3 - 4x^2 + (1)x^3 = 3x^3 - 4x^2$

Like Terms → $\sqrt[2]{2} + \sqrt[2]{2} = 2\sqrt[2]{2}$

Not the same as Add/sub → $\sqrt{2} \cdot \sqrt{2} = \sqrt{4} = 2$

$5\sqrt{2} - 3\sqrt{3} + 6\sqrt{2} = 11\sqrt{2} - 3\sqrt{3}$

Ex: $\sqrt{98} - 2\sqrt{32}$

$\sqrt{2 \cdot 49} - 2\sqrt{2 \cdot 16}$

$\sqrt{2} \cdot \sqrt{49} - 2\sqrt{2} \cdot \sqrt{16}$

7 7 4 4

$7\sqrt{2} - 2 \cdot 4\sqrt{2}$

$7\sqrt{2} - 8\sqrt{2} = -1\sqrt{2}$ or $-\sqrt{2}$

① $4\sqrt[2]{8} + 3\sqrt[2]{50}$

$\sqrt{2 \cdot 4} + 3\sqrt{2 \cdot 25}$

$4 \cdot 2 \cdot \sqrt{2} + 3 \cdot 5\sqrt{2}$

$8\sqrt{2} + 15\sqrt{2} = \boxed{23\sqrt{2}}$

(2) $5\sqrt{12} + 2\sqrt{27} - \sqrt{128}$

$5\sqrt[2]{3\cdot 4} + 2\sqrt[2]{3\cdot 9} - \sqrt[2]{2\cdot 64}$

$5\cdot 2\sqrt{3} + 2\cdot 3\sqrt{3} - 8\sqrt{2} =$

$10\sqrt{3} + 6\sqrt{3} - 8\sqrt{2} =$

$\boxed{16\sqrt{3} - 8\sqrt{2}}$