

Algebra II - Notes

Alg II
T6-4
Notes
1-29-14

1-29-14 T6-4 n^{th} Roots

* Simplifying expressions by adding, subtracting, multiplying and dividing

index $\rightarrow n$ $\sqrt[n]{81}$ radical sign
radicand

square root $\rightarrow \sqrt{\quad}$ index

review

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

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

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

$(-5)^{101} \rightarrow$ odd negative #
 $(-5)^{100} \rightarrow$ even positive #

if n odd

- one real root
- absolute values never needed

$\sqrt[3]{\quad}$

if n even

- If you have an even root & even power and 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:

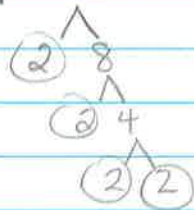
$$\sqrt[2]{16} = \sqrt[2]{4^2} = 4$$

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

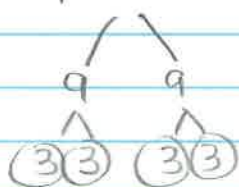
$$\sqrt[2]{32} = \sqrt[2]{16 \cdot 2} = \sqrt[2]{4^2 \cdot 2} = 4\sqrt{2}$$

What is:

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



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



index & exponent
cancel if they
are the same

What is: Even

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

ODD

ODD -
Do Not need
to worry
about
Absolute
Value
Sign

or

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

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

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

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

$$\pm \overset{\text{even}}{\sqrt[2]{36x^{10}}} = \pm \sqrt[2]{6^2 x^{\overset{\text{even}}{10}}} = \pm 6|x^{\overset{\text{odd}}{5}}| \text{ - absolute value sign}$$

$$-\overset{\text{even}}{\sqrt[2]{(y+7)^{\overset{\text{even}}{16}}}} = -(y+7)^{\overset{\text{even}}{8}} \text{ no absolute value sign}$$

$16 \div 2 = 8$

exponent \div index

$$\overset{\text{even}}{\sqrt[4]{x^{\overset{\text{even}}{12}}}} = x^{\overset{\text{odd}}{3}} = \boxed{|x^3|} \text{ ← absolute value sign}$$

$\rightarrow 12 \div 4 = 3$

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

$27 \div 3 = 9$

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

$50 \div 5$

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

$25 \div 5 = 5$

What is:

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

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

$20 \div 5 = 4 \quad 25 \div 5 = 5$

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

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

$18 \div 6 = 3$

even

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

even

odd

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 =

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

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

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

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

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 → $\sqrt[3]{2} + \sqrt[3]{2} = 2\sqrt[3]{2}$

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

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

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

$$\begin{aligned} & \sqrt{2 \cdot 49} - 2\sqrt{2 \cdot 16} \\ & \downarrow \qquad \downarrow \\ & \sqrt{2} \cdot \sqrt{49} - 2\sqrt{2} \cdot \sqrt{16} \\ & \qquad \uparrow \qquad \qquad \uparrow \\ & 7\sqrt{2} - 2 \cdot 4\sqrt{2} \end{aligned}$$

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

① $4\sqrt[3]{8} + 3\sqrt[3]{50}$

$$\begin{aligned} & \sqrt[3]{2 \cdot 4} + 3\sqrt[3]{2 \cdot 25} \\ & 4 \cdot 2 \cdot \sqrt[3]{2} + 3 \cdot 5 \sqrt[3]{2} \\ & 8\sqrt[3]{2} + 15\sqrt[3]{2} = \boxed{23\sqrt[3]{2}} \end{aligned}$$

$$\textcircled{2} \quad 5\sqrt{12} + 2\sqrt{27} - \sqrt{128}$$

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

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

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

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