Name:______________________________ Date:__________

Class worksheet: Alg2H

Powers andRoots (I): Basic properties.

(book chapter 7, page 290 to 299)

Number System.
Exponents rules.

This unit: - Man made
- connect all together
- (exp/roots)
- complex Numbers

Square root: $x^2 = A$

we say 'x is square root of A'.

$A = 25 \to x^2 = 25 \to x = 5$ or $x = -5$.

$A = 16 \to x = 4$ or $x = -4$.

$A = -4 \to$ no square root. $A = 0 \to \underline{x = 0}$

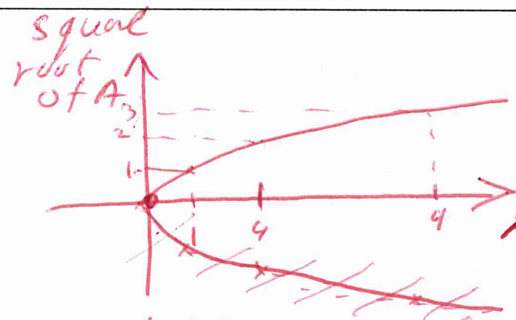
Each positive has two. Zero has one. Negative have none!

Principal square root , radical sign:

symbol: $\sqrt{\ }$

Represents the non-negative square root of A.

if we want negative: $-\sqrt{(\ )}$



Relation $\downarrow$ function

radical sign $\to \sqrt{\bigcirc} \leftarrow$ radicand

Absolute value part I:

$\sqrt{(5)^2} = \sqrt{25} = 5$

$\sqrt{(-5)^2} = \sqrt{25} = 5$

$\sqrt{x^2} = \begin{cases} x & \text{if } x \ge 0 \\ -x & \text{if } x < 0 \end{cases} \Rightarrow \sqrt{x^2} = |x|$

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$\sqrt{(-8)^2} = 8$, $\sqrt{(3b)^2} = 3|b|$, $\sqrt{(x-1)^2} = |x-1|$.

Cube root: $x^3 = A$ we say 'x is cube root of A'.

$2^3 = 8 \rightarrow 2$ is cube root of 8.

$(-3)^3 = -27 \rightarrow -3$ is - - -27.

Every real number $\rightarrow$ exactly ONE cube root.

symbol: $\sqrt[3]{A}$ — k^{th} root. index.

if k is odd, we call it ODD root.

2 is default
we say 'square root'
~~rather then "principal"~~.

Absolute value part II:

Odd and even Roots:

$2^4 = 16 \qquad (-2)^4 = 16 \qquad \sqrt[4]{2^4} = 2$

$\sqrt[4]{(-2)^4} = 2$

$2^3 = 8 \qquad (-2)^3 = -8 \qquad \sqrt[3]{8} = 2$

$$\boxed{\begin{array}{ll} \text{Even } k: & \sqrt[k]{a^k} = |a| \\ \text{Odd } k: & \sqrt[k]{a^k} = a \end{array}}$$

$\sqrt[4]{81} = 3 \qquad \sqrt[4]{-81} = $ Not real.

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

Multiplying and simplifying:

$$\sqrt{4}\cdot\sqrt{25} = \begin{cases} \to 2\cdot 5 = 10 \quad ✓ \\ \to \sqrt{4\cdot 25} = \sqrt{100} = 10 \quad ✓ \end{cases}$$

$$\sqrt[3]{27}\cdot\sqrt[3]{8} = \begin{cases} \to 3\cdot 2 = 6 \quad ✓ \\ \to \sqrt[3]{8\cdot 27} = \sqrt[3]{216} = 6 \quad ✓ \end{cases}$$

$$\boxed{\sqrt[k]{a}\cdot\sqrt[k]{b} = \sqrt[k]{ab}}$$

what do we use it for?

$\sqrt{20} = \sqrt{4\cdot 5} = \sqrt{4}\cdot\sqrt{5} = 2\sqrt{5}$

$\sqrt{50} = \sqrt{2\cdot 25} = \sqrt{2}\cdot 5.$ // do $\sqrt{180x^4}$ example here!

$\sqrt{1}$ $-\sqrt{4}$	$\sqrt{0.01}$ $\sqrt{(-17)^2}$
$\sqrt{(2x)^2} = 2\lvert x\rvert$ $\sqrt{(-x)^2} = \lvert x\rvert$	$\sqrt{x^2+10x+25} = \lvert x+5\rvert$

$\sqrt[7]{x^{14}} = \sqrt[7]{(x^2)^7} = x^2$. $\sqrt[7]{(3x+2)^7} = 3x+2$.	$\sqrt[4]{(x-1)^8} = (x-1)^2$ $\sqrt[6]{2^6x^6} = 2\lvert x\rvert$
How to factor for	roots!
$\sqrt{180x^4}$	$180 = 2^2 \cdot 3^2 \cdot 5$
180 2 90 2 45 5 9	$\sqrt{2^2 \cdot 3^2 \cdot 5 \cdot (x^2)^2} =$
3 3 3 1	$= 2 \cdot 3 \cdot x^2 \cdot \sqrt{5}$ $= \boxed{6x^2\sqrt{5}}$