## Roots of negative numbers

- an odd root of a negative # is negative
- [redacted] an even root of a negative is nonreal

17 22 26

Positive? negative? or not real?

a) $\sqrt{13}$ : positive

b) $\sqrt[5]{-17}$ neg

c) $\sqrt[10]{-10}$ not real

d) $\sqrt[\text{even}]{-2}$ (odd) = not real

e) $\sqrt[\text{odd}]{-1}$ = $-1$
neg

neg.

## Writing the Prime Factorization of Expressions Containing Variables

Divisibility ~~rules~~ rules for 2 and 5

Any # that ends in 0, 2, 4, 6, or 8 divisible by 2, even #

Any # that ends in 0, 5. divisible by 5

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# Writing the Prime Factorization of Expressions Containing Variables

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lecture notes p.114

## § Ch. 7.1 (cont'd)

### Writing Prime Factorization of Expressions contain Variable

Divisibility Rules

Rule for 3 - If you add the digits and you have a number divisible by 3

Rule for 9 - sum of digits divisible by 9

639. $6+3+9=18$ ✓

If they don't work use these prime #'s

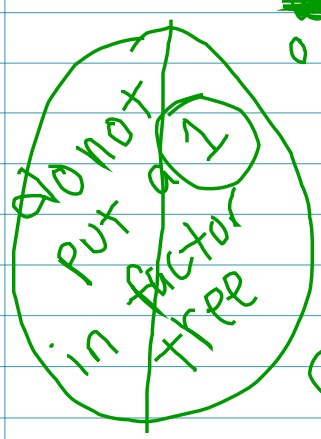
2, 3, 5, 7, 11, 13, 17, 19, 23, 29

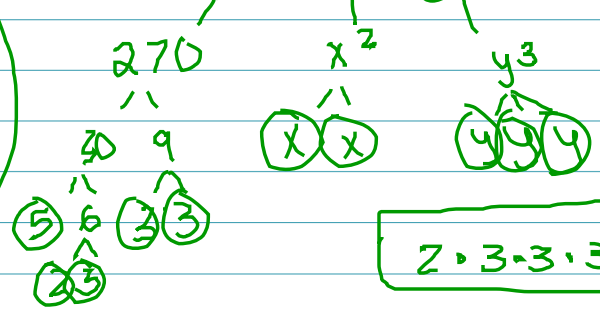
$\boxed{\text{AACYM2K 7.11.1}}$

or

Write the Prime factorization

$270x^2y^3$




$\boxed{2\cdot3\cdot3\cdot3\cdot5\cdot x\cdot x\cdot y\cdot y\cdot y}$

## find squareroots, cuberoots, and $n^{th}$ roots of expressions containing varibles

$\sqrt{x^2+y^6}$ ← cannot have an addition or subtraction

$$\sqrt{x^2y^6} = \sqrt[2]{xx\ yyyyyy} = xy^3$$

(16) simplify, if possible

$$\sqrt{16x^6}$$

$$\sqrt{2\cdot2\cdot2\cdot2\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x} = 2\cdot2\cdot x\cdot x\cdot x = 4x^3$$

(24) Find cube root if possible

root is odd

$$\sqrt[3]{-125x^{12}} = -\sqrt[3]{125x^{12}}$$

negative

$$125x^{12}$$

5 25

5 5

$$= -\sqrt[3]{5\cdot5\cdot5\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x}$$

$$= -5xxxx = -5x^4$$

7.1.2 $\sqrt{16x^6}$ Simplify if possible

Because of the plus sign, it $\boxed{\text{cannot}}$ be simplified.

29 $\sqrt[6]{729x^6}$

$729$

$9 \cdot 81$

$3 \cdot 3 \quad 9 \cdot 9$

$3 \cdot 3 \quad 3 \cdot 3$

$\sqrt[6]{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x} = 3x$

43 Simplify, if possible

$\sqrt[6]{a^{72}b^6}$

$\sqrt[6]{\underbrace{a \cdot a \cdot \ldots a}_{72 \text{ of them}} \cdot \underbrace{b \cdot b \cdot \ldots b}_{6 \text{ of them}}} =$ twelve a's mult of one group of b's

$a^{12}b$

# Square Roots vs. Principal Square Roots

$\sqrt{(-7)^2} = \sqrt{49} = -7$

"P" for principal, "P" for Positive

What are the square roots of 49

7 and -7.

7.1.1 (a) What are the square roots of 36?
(b) What is $\sqrt{36}$?

a) -6 and 6
b) 6

## Finding n'th Roots of $a^n$ Where a is any real #.

If your variable could be negative and your index is even, then you need ABSOLUTE value bars

(34) Simplify. Assume variable reps any real #.

$\sqrt{49x^2}$ • could variable be neg? Yes

Is index even? Yes

$\sqrt[2]{7 \cdot 7 \cdot x \cdot x}$

$|7 \cdot x|$ or $7|x|$ ← for my math lab

(35) Simplify. X is any real #.

$\sqrt[3]{x^3}$ Could variable be neg - Yes

$\sqrt[3]{x \cdot x \cdot x}$ Is index even? NO

$x$

# § 7.2 Rational Exponents (lec Notes p.118)

## Positive rational Exponents

$(4)^{\frac{1}{2}} = \sqrt[2]{4} = \sqrt{4} = 2$

$9^{\frac{1}{2}} = \sqrt[2]{9} = \sqrt{9} = 3$

$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$

$16^{\frac{1}{4}} \rightarrow \sqrt[4]{16} = 2$

$\left(\frac{16}{81}\right)^{\frac{1}{4}} = \sqrt[4]{\frac{16}{81}} = \boxed{\frac{2}{3}}$

$\boxed{\frac{2}{3}} \cdot \boxed{\frac{2}{3}} \cdot \boxed{\frac{2}{3}} \cdot \boxed{\frac{2}{3}} = \frac{16}{81}$

Hint: The denominator of your fractional exponent is the index of the radical

11, 14, 16

a) $\left(\frac{16}{625}\right)^{14} = \sqrt[4]{\frac{16}{625}} = \frac{2}{5}$

$\boxed{\frac{2}{5}} \cdot \boxed{\frac{2}{5}} \cdot \boxed{\frac{2}{5}} \cdot \boxed{\frac{2}{5}} = \frac{16}{625}$

b) $-81^{\frac{1}{4}} = -1 \cdot 81^{\frac{1}{4}}$

$-1 \cdot \sqrt[4]{81} = -1 \cdot 3 = -3$

c) $(16x^4)^{(1/2)}$

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

$= \sqrt{16x^4}$

$= \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x} = 2 \cdot 2 \cdot x \cdot x = 4x^2$

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

21) Use radical notation to write the expression. Simplify if possible. No value bars

$(5x+3)^{\left(\frac{4}{5}\right)} = \sqrt[5]{(5x+3)^4} = \cancel{\sqrt[5]{5x^4+81}}$

or

$\left(\sqrt[5]{5x+3}\right)^4$

Sidework

$(5x+3)^4$

$(5x+3)(5x+3)(5x+3)(5x+3)$

(19) Use radical notation, Simplify, and varify w/calculator!

$(-81)^{\frac{3}{4}} = \sqrt[4]{(-81)^3} = \sqrt[4]{-531441}$

= Not a real #

$(-81)^{(3/4)}$ = ERROR

(20) Use radical notation. Simplify if possible. Will use value Bars

$(3x)^{(3/5)}$

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

$\sqrt[5]{27x^3}$