A real number raised to an even power is ALWAYS POSITIVE.

A real number raised to an odd power can either be negative or positive.

The answer will have the same sign as the base.

When there is nothing in front of an even radical the answer must be POSITIVE.
"Principal Root"

The answer from an odd radical can be Pos or Neg.

What do you do to find the root of a variable with an exponent?

Divide the exponent by the index.

For example: $\sqrt[5]{m^{30}} = m^{\frac{30}{5}} = m^{6}$

When simplifying radicals:

You MUST use Absolute Value symbols when

1. The index is EVEN and the result could be negative
   answer is something to an odd power

You DON'T use Absolute Value symbols when

1. The index is ODD
2. The index is EVEN but the result won't be negative
   answer is something to an even power

Simplify each. Use absolute value symbols when needed.

5. $\sqrt{25x^{14}} = 5|x^7|$

Since the index is even we must be sure that the answer ends up being POSITIVE.
Absolute values are needed around x^7 because this quantity could be negative but we must ensure that the result is Positive.

Simplify each. Use absolute value symbols when needed.

6. $\sqrt{x^{11}} = \sqrt{x^{10} \cdot x^1}$

Since we are trying to divided the exponents by 2 we need to break up x^{11} into two powers of x that add up to 11, where one of the exponents is divisbleby 2, preferably the largest number divisible by 2 less than 11.

we can now take the square root of x^{10} to get x^5. But the other factor, x^1 stays under the square root.

$= |x^5|\sqrt{x}$

Simplify each. Use absolute value symbols when needed.

7. $\sqrt{x^{21}} = x^{10}\sqrt{x}$

another way to simplify this expression is to do the following:

- The exponent on X outside the radical is the number of times that the index divides into the exponent
- The exponent on the X inside the radical for the answer is the remainder when doing this division. If there is no remainder then this variable won't appear under the radical in the answer.

For this problem you would say to yourself:
"2 goes into 21 ten times with a remainder of 1"
This is why the coefficient is x^{10} and x^1 is left under the radical.

Simplify each. Use absolute value symbols when needed.

8. $\sqrt{16x^{27}} = 4|x^{13}|\sqrt{x}$

since x^{13} could be negative and it's coming out of a radical with an even index we need to make sure it becomes positive by putting it inside absolute values.

Simplify each. Use absolute value symbols when needed.

9. $\sqrt{25a^{18}b^{7}c^{13}} =$ $5\,|a^{9}|\,|b^{3}|\,c^{6}\sqrt{bc}$ or $5\,|a^{9}b^{3}|\,c^{6}\sqrt{bc}$

10. $\sqrt[3]{x^{6}} =$ x^{2}

since the index is ODD

NO absolute value symbols are used.

Simplify each. Use absolute value symbols when needed.

11. $\sqrt[3]{x^{15}} =$ x^{5}

ODD index means NO abs. value symbols

Simplify each. Use absolute value symbols when needed.

12. $\sqrt[3]{8x^{33}} =$ $2x^{11}$

for both problems the index is odd so NO absolute values are used.

13. $\sqrt[3]{x^{14}} =$ $x^{4}\sqrt[3]{x^{2}}$

3 goes into 14 4 times with a remainder of 2

Simplify each. Use absolute value symbols when needed.

14. $\sqrt[3]{x^{22}} =$ $x^{7}\sqrt[3]{x^{1}}$

3 goes into 22 seven times with a remainder of one.

Simplify each. Use absolute value symbols when needed.

15. $\sqrt[3]{-27e^{12}f^{17}g^{19}}$ =

= $-3e^4 f^5 g^6 \sqrt[3]{f^2 g}$

Simplify each. Use absolute value symbols when needed.

16. $\sqrt[4]{16m^{12}n^{25}}$ = $2|m^3|n^6\sqrt[4]{n}$

need abs. val. symbols here because index is even & m^3 could be negative.

Simplify each. Use absolute value symbols when needed.

17. $\sqrt[5]{32R^{21}S^{34}}$ =

= $2R^4S^6\sqrt[5]{RS^4}$

Absolute value symbols **may** be needed when taking an ___even___ root.

Absolute value symbols are **not** used when taking an ___odd___ root.

If the result of an ___even___ root **could** be negative then absolute value symbols are needed.

This will occur when the result of taking the root is a variable raised to an ___odd___ power.

You can now finish Hwk #33:
Sec 7-1

Due Friday

page 372

probs 3-5, 9, 23-25, 27, 44, 45, 50, 51

Simplify each. Use absolute value symbols when needed.

1. $\sqrt[4]{405w^{37}x^{27}}$

$3^4=81$ $\quad 81\cdot 5$

$= 3|w^9|x^6\sqrt[4]{5wx^3}$

Simplify each. Use absolute value symbols when needed.

2. $\sqrt[5]{96a^{23}b^{46}}$

$2^5=32$ $\quad 32\cdot 3$

$= 2a^4b^9\sqrt[5]{3a^3b}$