LESSON 35

Section 7.1
Basic of Roots (Radicals)

Definition of a Square Root

c is a square root of a

if and only if

$$c^2 = a$$

Find any square root(s) of…

100

144

25

400

$\frac{4}{49}$

0.16

Find any square root(s) of…

-4

-64

Conclusion

- If ***a*** is a positive number, there are two square roots; one positive and one negative.
- If ***a*** is a negative number, there is no real square root.
- If **a** is zero, there is one square root, zero.

Principal Square Root

- The principal square root of a positive number is the positive square root.
- It is indicated by this sign.

$$\sqrt{a}$$

Examine these.

$\sqrt{16} = 4,$

$-\sqrt{16} = -4,$

$\pm\sqrt{16} = 4, -4$

$\sqrt{-16}$ does not exist

Find the following.

$-\sqrt{9} =$ $\quad$ $\sqrt{0.16} =$

$\sqrt{\frac{25}{64}} =$ $\quad$ $-\sqrt{121} =$

$\sqrt{324} =$ $\quad$ $-\sqrt{\frac{121}{81}} =$

Square Root Function

If $r(x) = \sqrt{6x-3}$, find the following.

$r(2) = \sqrt{6(2)-3} = \sqrt{12-3} = \sqrt{9} = 3$

$r(-1) =$

$r(4) =$

$f(t) = \sqrt{3t-2}$ Find...

$f(1)$

$f(2)$

$f(9)$

$f(-3)$

Other Types of Roots

$\sqrt[n]{a} = c$ if and only if $c^n = a$

Radical Sign:

n: the index

'a': the radicand

$\sqrt[n]{a}$ is a radical!

$\sqrt[3]{-64} =$ $\quad$ $\sqrt[4]{81} =$

$\sqrt[5]{-1} =$ $\quad$ $\sqrt[3]{125} =$

$\sqrt[4]{-16} =$

Notice: An 'odd' root of a negative value is real. An 'even' root of a negative does not exist.

Roots with variables

$\sqrt[n]{a}$

- If *n* is 'even', this expression is only defined if *a* is positive.
- **Therefore we will always assume that all variables are positive when figuring roots.**

Find the following.

$\sqrt{x^2} = x$

$\sqrt{r^6} =$

$\sqrt[3]{m^3} =$

$\sqrt[3]{a^9} = a^3$

$\sqrt[4]{n^4} = n$

$\sqrt[5]{t^{10}} =$

In general: If k is a multiple of n ---

$$\sqrt[n]{a^k} = a^{k \div n}$$

Find the following.
Assume all variables are positive.

$\sqrt{x^{10}} =$

$\sqrt{(x+1)^2} =$

$\sqrt{25t^4} =$

$\sqrt{(8m)^4} =$

$\sqrt[4]{81x^{12}} =$

$\sqrt[4]{a^{20}} =$

$\sqrt{(a+b+c)^6} =$