Chapter 7 Section 1
Radical Expressions and Functions

Square Roots

$5^2 = 25$

$(-5)^2 = 25$

reverse operation of squaring a number is finding the square root of the number

Example:

One square root of 25 is 5 because $5^2 = 25$

Another square root of 25 is -5 because $(-5)^2 = 25$

If $b^2 = a$, then b is the square root of a.

Symbol: $\sqrt{\ }$ denotes the positive or principal square root of a number.

Example:

$\sqrt{25} = 5$ because $5^2 = 25$ and 5 is positive.

Symbol: $\sqrt{\ }$ is used to denote the principal square root is called a radical sign.

Number under the radical sign is called the radicand.

Together is called a radical expression.

- $\sqrt{\ }$ denotes the negative square root of a number

- $\sqrt{25} = -5$ because $(-5)^2 = 25$ and - 5 is negative.

Example 1: page 503.

Evaluate:

a) $\sqrt{81}$ b) $-\sqrt{9}$ e) $\sqrt{36+64}$

Square Root Function

Defined: $f(x) = \sqrt{x}$

Domain: $[0, \infty)$

Graph by selecting nonnegative real numbers for x.

Evaluating Square Root Functions:
Example 2: page 504.
a) $f(x)=\sqrt{5x-6}$: f(3)

Find: $f(x)=\sqrt{9x-27}$: f(5)

Example 3: page 505:
Finding the Domain of a Square Root Function
$f(x)=\sqrt{3x+12}$

Find: $f(x)=\sqrt{9x-27}$

Form: $\sqrt{a^2}$
$\sqrt{a^2}$ = a ??

Look at the following
$\sqrt{4^2}=\sqrt{16}=4$ and $\sqrt{(-4)^2}=\sqrt{16}=4$
to get the positive value,
$\sqrt{a^2}$ = | a |

Example 5: page 506
a) $\sqrt{(-6)^2}$ b) $\sqrt{(x-5)}$ c) $\sqrt{25x^6}$

Cube Roots and Cube Root Functions
Cube root of a real number, a, is written $\sqrt[3]{a}$
$\sqrt[3]{a}=b$ means that $b^3=a$

Example: $\sqrt[3]{64}=4$ because $4^3=64$

Cube root of a negative number is a real number
All numbers have cube roots.
Cube root of positive number is positive, the cube root of a negative number is negative.

Cube root function: $f(x)=\sqrt[3]{x}$
Domain: All real numbers

Evaluating Cube Root Functions

$f\left(x\right)=\sqrt[3]{x-2}$; f(127)

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

Example 7: Page 508

$\sqrt[3]{-64x^3}$

Even and Odd nth Roots

$\sqrt[n]{a}$ nth root of a, n called the index.

Index odd, same characteristics as cube roots.
Index even, same characteristics as square roots.

Even root of a negative number is not a real number

$\sqrt[n]{a^n}$

n even, $\sqrt[n]{a^n}=\left|a\right|$

n odd, $\sqrt[n]{a^n}=a$

Example 9: Page 510:

a) $\sqrt[4]{\left(x-3\right)^4}$ b) $\sqrt[5]{\left(2x+7\right)^5}$