Fun Fact

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$
$11^2 = 121$
$12^2 = 144$
$13^2 = 169$
$14^2 = 196$
$15^2 = 225$
$16^2 = 256$
$17^2 = 289$

25-50% of all food is wasted.

$1^3 = 1$
$2^3 = 8$
$3^3 = 27$
$4^3 = 64$
$5^3 = 125$
$6^3 = 216$
$7^3 = 343$
$8^3 = 512$
$9^3 = 729$
$10^3 = 1000$

Squares & Cubes. All my fault.

7.1 Radicals & Radical Functions.

$\sqrt[2]{x} = y$ means $x = y^2$ Square Root

$\sqrt[2]{25} = 5$ b/c $5^2 = 25$

Cube Root

$\sqrt[3]{x} = y$ means $x = y^3$

$\sqrt[3]{1000} = 10$

$f(x) = \sqrt{x}$ is square root function

$f(16) = \sqrt{16} = 4$

$f(-36) = \sqrt{-36}$ is not real.

There is no real number x such that

$x^2 = -36$

If $x > 0$ $x^2 > 0$

$3 > 0$ $3^2 = 9 > 0$

$x < 0$ $x^2 > 0$

$-3 < 0$ $(-3)^2 = (-3)(-3) = +9 > 0$

No way to hit -36 with a real number squared.

The domain of $f(x) = \sqrt{x}$ is

$\{x \mid x \geq 0\} =$  $= [0, \infty)$

If $x < 0$, $\sqrt{x}$ is not real.

We want to keep it real.

The domain of $\sqrt{\square}$ is

$\{\square \mid \square \geq 0\}$

What's the domain of...

... $f(x)=\sqrt{3x+2}$?

Need $3x+2 \geq 0$

$-2 \quad = -2$

$3x \geq -2$

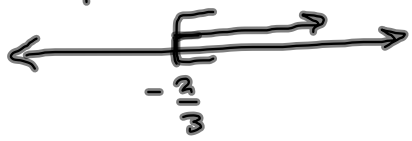
$\frac{3x}{3} \geq \frac{-2}{3}$

$x \geq -\frac{2}{3}$

Domain =

$\{x \mid x \geq -\frac{2}{3}\}$

$= \left[-\frac{2}{3}, \infty\right)$



Notice that

$$(-2)^3 = (+2)(+2)(-2) = -8$$

So there are perfect cubes that are negative.

$$\sqrt[3]{-8} = -2$$

This is because 3 is odd.

Domain of $\sqrt[3]{x}$ is all real numbers

$$= \{x \mid x \text{ is Real}\} = \longleftrightarrow$$

$$= (-\infty, \infty)$$

See Helpful Hint, pg 415.

Nov 5-9:35 AM

Circle whats not Real

$\sqrt{-15}$, $\sqrt[3]{-15}$, $\sqrt[4]{-15}$, $\sqrt[5]{-15}$

Index is even

Index is even

$\sqrt[3]{-15} \approx -2.466212074$

```
                    5
25^(1/2)            5
27^(1/3)            3
125^(1/3)           5
```

```
                    5
27^(1/3)            3
125^(1/3)           5
(-15)^(1/3)
     -2.466212074
```

$\sqrt{(-2)^2} = 2 = |-2|$

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

$\sqrt{\ }$ reports ONLY the positive root

$\sqrt{x}$ is the PRINCIPAL square root

(There are always 2 square roots)

$5^2 = 25$

$(-5)^2 = 25$

In general

$\sqrt{x^2} = |x|$

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

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

$\sqrt[3]{(-2)^3} = -2$, because $(-2)(-2)(-2) = -8$, because 3 is odd

$\sqrt[4]{x^4} = |x|$ $\quad \sqrt[5]{x^5} = x$

$\sqrt[6]{x^6} = |x|$ $\quad \sqrt[7]{x^7} = x$

$\sqrt[8]{x^8} = |x|$ $\quad \sqrt[9]{x^9} = x$

Even index radicals are slightly different.

Remember $\sqrt[4]{x^4} = |x|$ for #s 43-54, where they say "... variables represent real numbers."

For #s 29-42, they say "... variables represent nonnegative real numbers"

If x is nonnegative, then $|x| = x$, so #29-42, don't do the $|x|$ bit.

$2^5 = 32$, so $\sqrt[5]{32} = 2$

$\sqrt[5]{x^{10}}$ Find $\square$ so that $\square^5 = x^{10}$

$= x^2$ $\square^5 = x^{2 \cdot 5} = (x^2)^5$

$\sqrt[5]{x^{15}} = \sqrt[5]{(x^3)^5} = x^3$, b/c

$(x^3)^5 = x^{3 \cdot 5} = x^{15}$ ✓

§7.1 #s 1, 5, 9, 13, 17, 21, 25, 29, 31, 35, 39, 43, 45, 47, 53*, 54*, 59, 63, 69, 73, 77-80

Most should go quickly.

End of class, Monday.