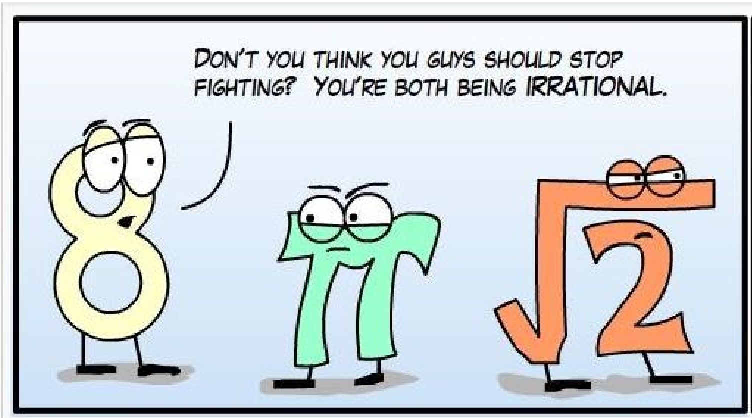
4.4: Irrational Numbers and Radicals

April 6, 2017 8:42 AM



I fear that I will always be
A lonely number like root three
A three is all that's good and right,
Why must my three keep out of sight
Beneath a vicious square root sign,
I wish instead I were a nine
For nine could thwart this evil trick,
With just some quick arithmetic
I know I'll never see the sun, as 1.7321
Such is my reality, a sad irrationality
When hark! What is this I see,
Another square root of a three
Has quietly come waltzing by,
Together now we multiply
To form a number we prefer,
Rejoicing as an integer
We break free from our mortal bonds
And with a wave of magic wands
Our square root signs become unglued
And love for me has been renewed.

By: David Feinberg

<u>Irrational Numbers</u>

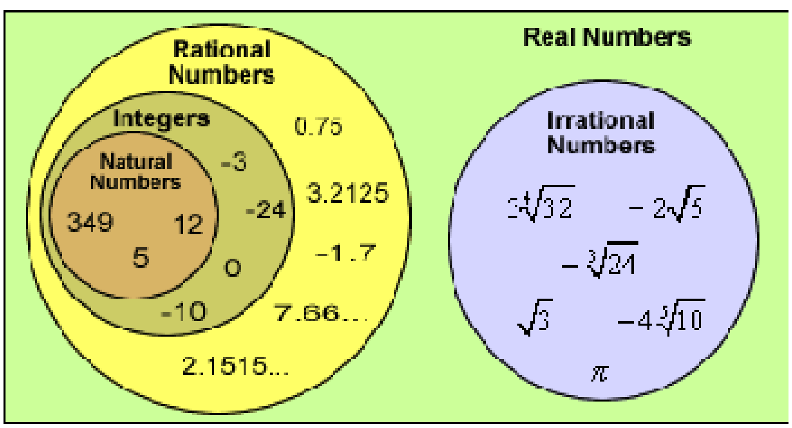
A number that cannot be expressed in the form of a fraction of integers.

- These numbers cannot be written as a terminating or repeating decimal number

Ex:

$\pi = 3.14159235.....$

$\sqrt{2} = 1.414213562...$



Remember from yesterday:
Converting from power form to radical form

$$x^{\frac{m}{n}} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m$$

Ex: Convert from a power to a radical

$$(8x^2)^{\frac{1}{3}} = 8^{\frac{1}{3}} x^{2\cdot\frac{1}{3}}$$

$$(x^4)^{\frac{3}{8}} = x^{4\cdot\frac{3}{8}}$$

$$= x^{\frac{12}{8}}$$

$$(8x^2)^{1/3} = 8^{1/3} x^{2\cdot\frac{1}{3}}$$
$$= 8^{1/3} x^{2/3}$$
$$= 2\sqrt[3]{x^2}$$
$$= 2\sqrt[3]{x^2}$$
or
$$= 2\left(\sqrt[3]{x}\right)^2$$

$$(x^4)^{3/8} = x^{12/8}$$
$$= x^{3/2}$$
$$= \sqrt{x^3}$$
or
$$= \left(\sqrt{x}\right)^3$$

Convert from a radical to a power

$$\sqrt[4]{x^3} = x^{\frac{3}{4}}$$
$$= x^{3/4}$$

$$\sqrt[n]{27^2} = 27^{\frac{2}{n}}$$
$$= 27^{2/n}$$
$$= \left(3^3\right)^{2/n}$$
$$= 3^{3\cdot\frac{2}{n}}$$
$$= 3^{6/n}$$

Convert Mixed radicals to Entire Radicals

$$4\sqrt{11} = \sqrt{16}\cdot\sqrt{11}$$
$$= \sqrt{(16\cdot 11)}$$
$$= \underline{\underline{\sqrt{176}}}$$

$$2\sqrt[3]{5} = \sqrt[3]{8}\cdot\sqrt[3]{5}$$
$$= \sqrt[3]{8\cdot 5}$$
$$= \underline{\underline{\sqrt[3]{40}}}$$

Convert mixed form to Power form

$$\sqrt[3]{24}\cdot 3^{2/3} = 24^{\frac{1}{3}}\cdot 3^{\frac{2}{3}}$$
$$= (3\cdot 8)^{1/3}\cdot 3^{2/3}$$

$$\frac{\left(3\sqrt{18}\right)\cdot\left(2^{3/2}\right)}{3^2} = \frac{\left(3\cdot\sqrt{9\cdot 2}\right)\left(2^{3/2}\right)}{3^2}$$
$$= 3\cdot\sqrt{9}\cdot\sqrt{2}\cdot 2^{3/2}$$

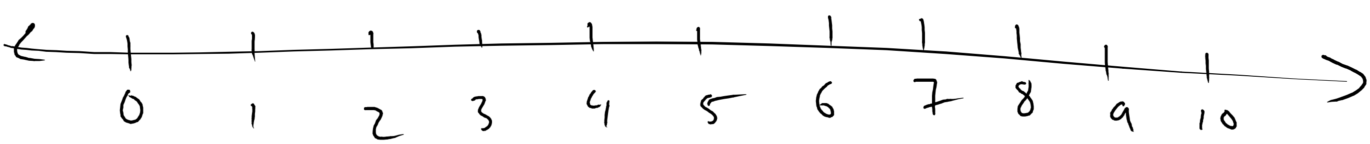
$$= (3\cdot 8)^{1/3}\cdot 3^{2/3}$$
$$= 3^{1/3}\cdot 8^{1/3}\cdot 3^{2/3}$$
$$= 3^{1/3}\cdot 3^{2/3}\cdot 8^{1/3}$$
$$= 3^{1/3+2/3}\cdot 2$$
$$= 3\cdot 2$$
$$= 6$$

$$\frac{\quad}{3^2}$$

$$\frac{\quad}{3^2}$$
$$= \frac{3\cdot\sqrt{9}\cdot\sqrt{2}\cdot 2^{3/2}}{3^2}$$
$$= \frac{\cancel{3}\cdot\cancel{3}\cdot\sqrt{2}\cdot 2^{3/2}}{\cancel{3}\cdot\cancel{3}}$$
$$= 2^{1/2}\cdot 2^{3/2}$$
$$= 2^{4/2}$$
$$= 2^2$$
$$= 4$$

Order the following from least to greatest

$$2\sqrt{18},\ 2^{3/2},\ 3\sqrt{2},\ \sqrt{32}$$



Homework CH 4.4 pg 192

1–9 (ace)
10, 12, 14, 19