Name:
Class: Math 1301
Page Number: 1
Date: 1-14-13
Topic/Section: Types of real numbers / Integer and Fractional exponents

Examples and Vocabulary	Notes/Comments/Questions
Counting or Natural numbers	How are natural numbers used?
$\{1, 2, 3, \dots\} = \mathbb{N}$	
↓	
Integers $= \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\} = \mathbb{Z}$	How are integers useful?
↓ $2x + 8 = 0$ $\quad -8 \quad -8$	$2x = -8$ $x = -4$
Rational numbers = any number that can be written as p/q where p and q are integers and $q \neq 0$ $= \mathbb{Q}$	What are other ways of defining the rational numbers?
Ex. $\frac{22}{7}, \frac{-5}{2}, -\frac{11}{4}, \frac{1}{3}, = 0.\overline{3}33$	
$\frac{12}{10} = \frac{6}{5} = 1.2, 2, 0 = \frac{0}{9} \neq \frac{9}{0}$ $= 2/1 = 4/2 = -4/-2$	

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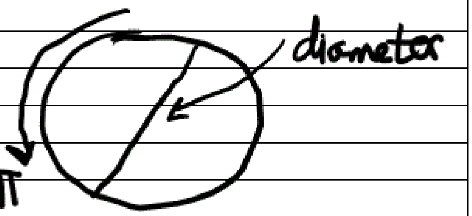
Irrational numbers = I

$\sim 1.414213562\ldots$

Ex. $\sqrt{2}$, $\sqrt{11}$, $-\sqrt[3]{5}$,

π, e, $\sqrt{9}=3$ circumference

What are some ways of creating irrational numbers?



$\frac{\text{circumference}}{\text{diameter}} = \pi$

Real numbers = any number that can be plotted on a real number line

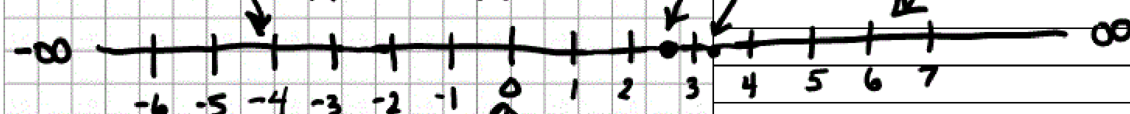
$\pi \sim 3.14159\ldots$

$e \sim 2.71828\ldots$

$x^2 = x \cdot x = +$

x?

x $\quad x^2 = x \cdot x = (-)(-) = +$



$x = x^2 = x \cdot x = 0 \cdot 0 = 0$

Ex. $\sqrt{-1} = x$ because $x^2 = -1$

$\sqrt{4} = 2$ because $2^2 = 4$

Is x a real number? No

Are all numbers real numbers? No

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Examples and Vocabulary	Notes/Comments/Questions
① Classify each number:	
$8, -8^2, \frac{1}{8}, \sqrt{8}, \sqrt[3]{8}$	
$\infty, \sqrt{-8}, 8.8, 8.\overline{8},$	
$8.808008000800008\ldots$	
$5^0, 4^{-2}, 8^{1/2},$	
$9.3 \times 10^7, 5.89 \times 10^{-6}$	

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Examples and Vocabulary	Notes/Comments/Questions
Rules for Integer and Rational Exponents	Why is it hard to remember how to simplify integer and fractional exponents?
$a^0 = 1$	What's the best way to do this?
$a^{-m} = \frac{1}{a^m} \quad (a \neq 0)$	What's the relationship between the sign of the exponent and the sign of the base?
$a^{1/n} = \sqrt[n]{a}$	How are fractional exponents related to roots?
$a^{m/n} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$	

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Examples and Vocabulary	Notes/Comments/Questions
a. 10^0 b. -10^0	
c. 10^{-1} d. 3^{-2}	
e. 5^{-3} f. $16^{1/2}$	
g. $27^{1/3}$ h. $32^{1/5}$	
i. $16^{3/2}$ j. $27^{2/3}$	
k. $16^{-3/2}$ l. $27^{-2/3}$	

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Examples and Vocabulary	Notes/Comments/Questions
② Estimate $\sqrt[5]{250}$ to three decimal places.	How can we estimate roots of numbers that are not perfect powers?