Math 4303 **FUNDAMENTALS OF MATH** Fall 2013
Dr. Duval **Homework**
Tuesday, August 27

Follow the separate general guidelines for Parts A,B,C. Be sure to include and label *all four* standard parts (a), (b), (c), (d) of Part A in what you hand in.

Real numbers; rational and irrational numbers

Section 2.1.1 (and intro to Unit 2.1)

A: Reading questions. Hand in Thu. 29 Aug., or earlier.

1. What did the Greeks discover about "commensurable" numbers, and why did it cause a problem? What does this have to do with the real number system?
2. What is the difference between a **rational number** and a **fraction**? Give an example of a rational number that is not a fraction, if one exists, and explain why your answer is correct. Give an example of a fraction that is not a rational number, if one exists, and explain why your answer is correct.
3. Give an example of a rational number and a way to write it so that it doesn't "look" rational.
4. Why would we want to write a rational number "in lowest terms"? Would we ever want to write a rational number *not* in lowest terms?
5. We'll prove Theorem 2.1 in class (see part B below). Meanwhile, explain why the statement of Theorem 2.1b refers to $\mathbf{Q} - \{\mathbf{0}\}$ instead of $\mathbf{Q}$.
6. What does it mean for a number to be *irrational*? Give an example of an irrational number, and how you know it's irrational.
7. On p. 24, the textbook refers to the identity $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$. Explain why this identity is true. Do **not** use "rules for exponents", since this identity is usually used to justify some of the rules for exponents. [Hint: Assume $a = s^2$ and $b = t^2$.]

B: Warmup exercises. For you to present in class. Due by end of class Thu., 29 Aug.

2.1.1 Problems: 4ab, 9a, 12a

The number line and decimal representation of real numbers
Section 2.1.2

Save the subsection "Repeating decimals" (pp. 32–33) until next class.

A: Reading questions. Hand in Tue. 3 Sep., or earlier.

1. Use the number line to give a definition of the **real numbers**. How could you find $\sqrt{5}$ *exactly* on a number line?
2. Some of the inequalities in Table 1 use the "∞" symbol. Rewrite these inequalities without the ∞ symbol.
3. Draw number line diagrams for each of the sets S and D described below Table 1.
4. Explain the connection between the **Nested Interval Property** and **decimal representations** of real numbers. Illustrate on a number line how this connection works for the real number 1/3.
5. Give your own example of a real number with two different decimal representations. If the decimal representations are different, why do we consider them to be the same real number?

B: Warmup exercises. For you to present in class. Due by the end of class Tue., 3 Sep.

2.1.2 Problems: 2, 3, 4, 6.