

**MATH 301/501 HOMEWORK 1—DUE AT THE BEGINNING OF CLASS ON
THURSDAY, SEPTEMBER 8.**

- (1) Access the New York State Common Core Standards for Mathematics. You can find these standards by exploring the web link on the course policy.
- (2) On the first day of class we discussed various sets of numbers, including natural numbers, integers, rational numbers, real numbers, complex numbers, and various inclusions. We also discussed *algebraic* motivations for studying larger sets of numbers. Look through the New York State Common Core Learning Standards, and determine which standards—at various grade levels—were addressed in our discussion. Write some of these down.
- (3) In class Samantha used the “zero property” in the middle of the proof. The property is that, for each a in S , $0 \times a = a \times 0 = 0$. Does this property hold if S is an arbitrary field? Does it hold if our set is an arbitrary ring? Give a proof of this property, and explain the context in which it holds.
- (4) In the same proof, a few students expressed that beginning with “let $x = \text{expression}$ ” could be confusing for secondary students. Rewrite the proof of the theorem, that $(-a)(-b) = (a)(b)$, using the same mathematical argument, but written to exclude this potentially distracting notation.
- (5) In class we wrote that, in a group G , Each element $g \in G$ has an additive inverse element $-g$, satisfying
$$g + -g = 0 = -g + g.$$
Jackie suggested that perhaps we should have said that: each element $g \in G$ has a *unique* inverse. Prove that uniqueness follows from the definition of a group.
- (6) Think about how the work we have done so far in class is relevant to the high school curriculum. Write a paragraph articulating your ideas. This is a mathematics class, so your paragraph should articulate *mathematical* ideas.