

**MAE 501 HOMEWORK-1 DUE AT THE BEGINNING OF CLASS ON THURSDAY,
SEPTEMBER 5**

One goal for this course is for you to develop your skill in effectively communicating mathematics. With this in mind, you should clearly write up your solutions. Solutions with little or no justification will receive little or no credit.

- (1)
 - (a) In class students presented different proofs of the equality $(-1)(-1) = 1$. Using the distributive property, along with other ideas from class, write a clear version of the proof that you think would work well for students first learning this identity, and explain the proof. Your proof should be for a student who does not have experience solving linear equations.
 - (b) Explain how this proof addresses the “Next Generation” math standard for extending properties of operations to integers and to rational numbers. (Grade 7 standard.)
 - (c) Give the values of 4^0 , 4^{-2} , and $4^{1/2}$.
 - (d) Explain how the values from part (c) must follow if we want to extend familiar properties of operations in the natural numbers to rational numbers.
- (2)
 - (a) Clearly write what it means for a set to be closed under an operation.
 - (b) Are the rational numbers closed under addition?
 - (c) Are the rational numbers closed under multiplication?
 - (d) Are the irrational numbers closed under addition?
 - (e) Are the irrational numbers closed under multiplication?
 - (f) Above, and elsewhere, make sure you prove/justify all responses!
- (3) Prove that $\sqrt{ab} = \sqrt{a}\sqrt{b}$, or give a counter-example.
- (4) In class we recalled the defining properties of a *ring* and a *field*, in the context of several examples. Look in the Next Generation Mathematics Standards, and note any reference to these properties. Where are they in the standards?