## Elementary Abstract Algebra: Examples and Applications

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Material from "Abstract Algebra, Theory and Applications" by Thomas Judson may be found throughout much of the book. A current version of "Abstract Algebra, Theory and Applications" may be found at abstract. ups.edu.

Chapters 4 and 5 are largely based on "Proofs and Concepts" (version 0.78, May 2009) by Dave Witte Morris and Joy Morris, which may be found online at:

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https://archive.org/details/flooved3499, or
http://people.uleth.ca/~dave.morris/books/proofs+concepts.html
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Please send comments and corrections to: thron@tamuct.edu. You may also request the LaTeX source code from this same email address.

YouTube videos are available: search on YouTube for the title of this book.

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## 1

## Math 301 Fall 2015 Test 1

- (1) Evaluate:  $\frac{(\overline{3+8i})}{7+6i}$ .
- (2) Given the expression:  $(((a-b)+b)+b)(a-b)+b^2$ 
  - (a) Simplify the expression using the associative law ONLY.
  - (b) Simplify the expression using the associative and distributive laws ONLY.
  - (c) Simplify the expression using the associative, distributive, and commutative laws.
- (3) A cubic polynomial of the form  $x^3 + ax^2 + bx + c$  (a, b, c are real) has roots 11 and 3 i. Find a, b, c.
- (4) Compute: mod(30!, 19). (Note: 30! means  $1 \cdot 2 \cdot 3 \cdot \ldots \cdot 30$ .)
- (5) Find all solutions to:  $367x \equiv 187 \mod 182$ . (Note: reduce before solving.)
- (6) Perform the following matrix multiplication mod 37. Simplify before multiplying:

$$\left(\begin{array}{cc} 409 & 372 \\ 743 & 189 \end{array}\right) \left(\begin{array}{cc} -105 & 410 \\ -300 & -225 \end{array}\right)$$