Math 4303 **FUNDAMENTALS OF MATH** Fall 2012
Dr. Duval **Homework**
Thursday, September 6

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.

Complex numbers; the complex numbers and the complex plane

Section 2.2.1 (and intro to Unit 2.2)

A: Reading questions. Due by 3pm, Wed., 12 Sep.

1. What problem (or problems) led to the discovery of complex numbers? When did the geometric representation become well known?
2. What does multiplication by i correspond to in the complex plane? What does multiplication by -1 correspond to in the complex plane? How can you use these to see that this corresponds to the identities $i^2 = -1$ and $i^4 = 1$?
3. In this section, complex numbers are represented as ordered pairs, with "binomial notation", as points in the complex plane, in polar coordinates, and in polar form. Explain the connection between all these representations, and illustrate with a "good" example. [What makes a "good" example? One that will help a student understand the idea. In general, stick to something simple (often: small integers), but not a special case.]
4. What is the complex conjugate of a complex number? How could you describe it in each of the representations above?

B: Warmup exercises. For you to present in class. Due by end of class Thu., 13 Sep.

2.2.1 Problems: 1, 2

The geometry of complex number arithmetic

Section 2.2.2 (you can skip the part about orbits.)

A: Reading questions. Due by 3pm, Mon., 17 Sep.

1. Illustrate the Parallelogram Law with an example (including the picture).
2. Although the vector proof of the distance formula (Theorem 2.19) is more elegant, give the algebraic proof, as suggested above the statement of Theorem 2.19.
3. Illustrate the Triangle Inequality (Theorem 2.20) with an example.
4. The derivation of the formula for the quotient of two complex numbers (at the top of p. 57) relies on a series of 3 equalities. Give the justification for each equality.
5. Give your own example of Theorem 2.21, similar to Example 1, but also draw pictures similar to Figures 17 and 18.
6. Show how the solutions to Example 2 fit the pattern of Theorem 2.23.

B: Warmup exercises. For you to present in class. Due by the end of class Tue., 18 Sep.

2.2.2 Problems: 1abc, 2, 4, 12

Theorem 2.22: Prove it in the special cases $n = 2, 3, 4$.