**Review for First Exam**

The first exam will cover Sections 1 through 14 of the text: all of Chapter 1 and the first three sections of Chapter 2. The problems should be similar to those on the first four homework assignments. Here is a list of the topics from these sections to review for the exam.

**1. Sums and products. 2. Basic algebraic properties.** These sections should be re-read, but all you need to remember from them is that the complex number $x + iy$ is associated to the pair $(x, y)$ of real numbers, and that the laws of addition and multiplication are the same for complex numbers as for real numbers, with the additional fact that $i^2 = -1$.

**3. Further properties.** Really the only thing you need to know from this section is the procedure for division illustrated in the Example on page 7.

**4. Vectors and moduli.** Most students would benefit by re-reading the entire section carefully from the beginning all the way through Example 3, and making sure they can add and subtract vectors in a diagram with facility.

**5. Complex conjugates.** Make sure you are quite familiar with all the numbered formulas in this section, (1) through (9).

**6. Exponential form.** Reread the first two pages of this section carefully. Notice the difference between "Arg $z$" and "arg $z$".

**7. Products and powers in exponential form.** Formulas (1), (2), (3), (4) are important; their use is shown in Examples 1 and 2. Note in particular formula (3) for $1/z$.

**8. Arguments of products and quotients.** Reread the entire section. The key formula is (2).

**9. Roots of complex numbers. 10. Examples.** Here is where the algebra of complex numbers differs most markedly from the algebra of real numbers: each complex number besides 0 has $n$ different $n$th roots, and you should know how to find them, as in the examples in Section 10.

**11. Regions in the complex plane.** Know the meanings of the terms *interior point, boundary point, exterior point, open set, closure of a set, connected set, domain.*

**12. Functions of a complex variable.** Review the entire section. Notice that its title is the same as the title of our course!

**13. Mappings. 14. Mappings by the exponential function.** Study each of the six examples in these two sections carefully. We also did some extra examples in class. (One involved finding the images of the horizontal and vertical lines in the $z$-plane under the mapping $w = z^2$; the images of these lines in the $w$-plane turned out to be parabolas.) Notice that I gave an extra technique in class for finding the images of curves under mappings: first find parametric equations for the curve, then use the equation for the mapping to find parametric equations for the image of the curve. For example, if the curve is the vertical line $x = 2$, it can be parameterized as $x = 2, y = t$, and the image under the map $w = z^2$ has parametric equations $u = x^2 - y^2 = 4 - t^2$ and $v = 2xy = 4t$.