# Math 312 Spring 98

## Quiz 3

Name: ________________________

Date: ________________________
Time Begun: ________________________
Time Ended: ________________________

Complex Analysis
**Friday January 30**
Ron Buckmire

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**Topic :** Mappings and Points Sets in the Extended Argand Plane

The point of this quiz is to provide another example of using functions as mappings and to give you more practice becoming familar with describing and sketching point sets of complex numbers. In addition it also tests taking limits of and evaluating functions of a complex variable in the extended $z$-plane.

## Instructions:

1. Once you open the quiz, you have as much time as you need to complete it, but record your start time and end time at the top of this sheet.
2. You may use the book or any of your class notes. You must work alone.
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution.
6. Relax and enjoy...
7. **This quiz is due on Monday, February 2**, in class. NO LATE QUIZZES WILL BE ACCEPTED.

**Pledge:** I, ________________________, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

Math 312 Spring 1998 **SHOW ALL YOUR WORK** Quiz 3

1. The *Joukowsky mapping* is a very famous mapping used in theoretical aerodynamics to represent cross-sections of airfoils. It is denoted by $J(z)$ and defined as

$$w = J(z) = \frac{1}{2}\left(z + \frac{1}{z}\right)$$

(a) (*6 points*) Sketch the image of the unit circle under the Joukowsky mapping. (Describe the image in the $w$-plane using complex inequalities.)

(b) (*1 point*) Show that $J(\frac{1}{z}) = J(z)$, for all $z$.

(c) (*2 points*) Compute $\lim_{z \to 0} J(z)$ and $\lim_{z \to \infty} J(z)$

(d) (*1 point*) Recalling that the definition of a function is that it is a one-to-one mapping, comment on the significance of your answers to question **(c)**: Is the Joukowsky mapping a function?