Math 312 Spring 2004

Quiz **4** — Complex Analysis

Name: _____

Date: _____ — **Friday February 13**

Time Begun: _____

Time Ended: _____ — Ron Buckmire

Topic : Harmonic Conjugates of Analytic Functions

The point of this quiz is to show you the usefulness of the Cauchy-Riemann equations and Harmonic Functions

Reality Check:

EXPECTED SCORE : _____/10 ACTUAL SCORE : _____/10

Instructions:

0. Before you open the quiz, check out the hint at `http://blackboard.oxy.edu`.
1. Once you open the quiz, you have 40 minutes to complete it.
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 Wednesday, February 18**, 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 2004 **SHOW ALL YOUR WORK** Quiz **Four**

We want to find a formula for an **entire** function $f(z)$ but all we know is that its real part is given by $u(x, y) = x^3 - 3xy^2 - 4xy + 6$ and that it maps the point $(1, 1)$ to the origin.

(a) (*6 points*) Use the Cauchy-Riemann Equations to find the imaginary part of $f(z)$, sometimes written as $v(x, y)$, *exactly*.

(b) (*2 points*) Show that both $v(x, y)$ and its harmonic conjugate solve the 2-dimensional Laplace Equation.

(c) (*2 points*) What is the image of the origin of the z-plane under the mapping $w = f(z)$?

BONUS (*5 points*) Write down the functions $f(z)$ and $f'(z)$ in a form which indicates it is a function of the complex variable z only.