Quiz 9 Complex Analysis

Name: ______________________

ASSIGNED: **Friday April 8**
DUE: **Monday April 11**

Time Begun: ______________
Time Ended: ______________

Prof. Ron Buckmire

Topic : Applications of Contour Integration to Real Trigonometric Integration

The **learning goal** of this quiz is to provide more practice with complex integration of a complex function and to show your understanding of the Cauchy Integral Formula and Residues in the context of evaluating a real integral.

Reality Check:

EXPECTED SCORE : __________**/10** ACTUAL SCORE : __________**/10**

Instructions:

1. Once you open the quiz, you have **30 minutes** to complete, please 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. QUIZZES WITH UNSTAPLED SHEETS WILL NOT BE GRADED.
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 April 11**, in class. NO LATE OR UNSTAPLED 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.

Fall 2001 Final Exam, Question 9. Evaluate $I = \displaystyle\int_0^{2\pi} \sin^4\theta \, d\theta$ using contour integration.

(a) *[4 points]* Show that I can be written as the contour integral $J = \dfrac{1}{16i} \displaystyle\oint_{|z|=1} \dfrac{(z^2-1)^4}{z^5} dz$.

[HINT: Use the fact that $z = e^{i\theta}$ to transform I into J.]

(b) *[4 points]* Show that the residue of the integrand $f(z) = \dfrac{(z^2-1)^4}{z^5}$ at $z = 0$ is 6. **What is the order of this singularity at** $z = 0$**?** [NOTE: $(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$.]

(c) *[2 points]* Compute the value of I by using Cauchy's Residue Theorem to evaluate J. (HINT: How are I and J related to each other?)