Quiz **12** EXPERIENCED CALCULUS I

Name: ____________________

Date: ____________________
Time Begun: ____________________
Time Ended: ____________________

Math 114
Wednesday, November 30, 2005
Ron Buckmire
Angela Gallegos

Topic: Multivariable Functions and their Extrema

This quiz is intended to provide you with an opportunity to illustrate your facility with partial differentiation and explore multivariable optimization.

Reality Check:

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

Instructions:

0. Before you open the quiz, check the course website or Blackboard for a hint.
1. Once you open the quiz, **you have 30 minutes to complete it**.
2. You may not use your text or any other source, including course materials. You may use a calculator. You must work alone. Do not discuss the contents of this quiz with anyone.
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 or borrow one. UNSTAPLED PAPERS 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. **This quiz is due on Monday, December 5**, at the beginning of 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.

Show all your work and explain all your answers.

1. Consider the function $z = f(x,y) = x^3 + y^3 - 6xy + 1$ on the unconstrained domain of **all** (x,y) values in the xy-plane.
a. *(2 points)* Compute $f_x(x,y)$ and $f_y(x,y)$.

b. (*6 points*) A **critical point** of a function $f(x,y)$ is a point (a,b) in the domain of f for which both the equations $f_x(a,b) = 0$ and $f_y(a,b) = 0$ are satisfied simultaneously. Find the location of all the critical points of $f(x,y) = x^3 + y^3 - 6xy + 1$.

b. (*2 points*) It turns out that $f(x,y) = x^3 + y^3 - 6xy + 1$ has one **local minimum** and one **saddle point** (i.e. a special kind of critical point which is neither a local maximum or local minimum of $f(x,y)$). Does $f(x,y)$ have a **global maximum value** and a **global minimum value**? CAREFULLY EXPLAIN THE REASONS FOR YOUR ANSWER ABOUT THE EXISTENCE OR NON-EXISTENCE OF GLOBAL EXTREMA FOR THIS FUNCTION.