Quiz **8** MULTIVARIABLE CALCULUS

Name: ______________________________ Assigned: **Friday March 27**

Due: **Monday March 30**

Time Begun: ____________________
Time Ended: ____________________ **Prof. Ron Buckmire**

Topic : Constrained Multivariable Optimization

The idea behind this quiz is to provide you with an opportunity to demonstrate your understanding of how to find the extrema of a multivariable function constrained to.

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 at the beginning of class on Monday March 30.**
   NO LATE OR UNSTAPLED QUIZZES WILL BE ACCEPTED FOR GRADING.

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.

1. Our goal is to find the maximum and minimum values of the surface $z = f(x, y) = x^2+y^2-x-y+1$ constrained to the interior of the unit disk $D : x^2 + y^2 \leq 1$.

(a) (*3 points*) Show that the only critical point of $f(x, y)$ occurs at $(1/2, 1/2, 1/2)$.

(b) (*2 points*) Show that since the boundary can be parametrized by the curve $\vec{x}(t) = (\cos(t), \sin(t))$ with $0 \leq t \leq 2\pi$ the surface intersected with the boundary becomes a curve $g(t) = f(x(t), y(t)) = 2 - \sin t - \cos t$.

(c) (*3 points*) Explain why $g(t)$ must attain its extreme values at either $t = 0$,$t = \pi/4$, $t = 5\pi/4$ or $t = 2\pi$.

(d) (*2 points*) Use information from (a), (b) and (c) to write down the coordinates of the maximum and minimum values of the surface $z = f(x, y)$ where the input values must lie in the set $D : x^2 + y^2 \leq 1$.