Math 212 Spring 2015

Quiz **5** MULTIVARIABLE CALCULUS

Name: _____ Assigned: **Friday February 20**

Due: **Friday February 23**

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

Topic : The Gradient Vector and the Directional Derivative

The idea behind this quiz is to provide you with an opportunity to illustrate your understanding of the gradient vector and directional derivatives.

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 February 23.**
   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. Suppose that in a certain region of space the electric potential V is given by

$$V(x, y, z) = 5x^2 - 3xy + xyz.$$

(a) (*3 points*) Compute $\vec{\nabla}V$, i.e. the gradient vector of the electric potential V.

(b) (*3 points*) Find $V_{\vec{u}}(1, 2, 3)$, the rate of change of the electric potential V at the point $P(1, 2, 3)$ in the direction of the vector $\vec{u} = \hat{i} + \hat{j} - \hat{k}$.

(c) (*2 points*) In which direction does the electric potential V change the most rapidly at the point $P(1, 2, 3)$?

(d) (*2 points*) What is the maximum rate of change of the electric potential V at the point $P(1, 2, 3)$?