Math 212 Spring 2015

Quiz **10** MULTIVARIABLE CALCULUS

Name: ______________________________ Assigned: **Friday April 17**

Due: **Monday April 20**

Time Begun: ____________________

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

Topic : Line Integrals and Gradient Fields

The idea behind this quiz is to provide you with another opportunity to illustrate your ability to compute line integrals and your understanding of the fundamental theorem of line integrals.

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 April 20.**
   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. Consider the vector field $\vec{F}(x,y) = (1 - ye^{-x})\hat{\imath} + e^{-x}\hat{\jmath}$.

(a) *(5 points.)* Show by direct computation that the line integral of $\vec{F}$ along the straight line path from $(0,1)$ to $(1,2)$ is $2e^{-1}$. [**HINT:** $\int ue^u\ du = ue^u - e^u$]

(b) *(3 points.)* Show that this vector field is a **gradient field**, in other words that there exists a function $f(x,y)$ such that $\vec{\nabla} f = \vec{F}(x,y) = (1 - ye^{-x})\hat{\imath} + e^{-x}\hat{\jmath}$. [**HINT: find** $f(x,y)$ **so that** $\vec{\nabla} f = \vec{F}$.]

(c) *(2 points.)* Use the Fundamental Theorem for Line Integrals (and your answer in **(b)**) to show that the value of the line integral of $\vec{F}$ from $(0,1)$ to $(1,2)$ is the same value regardless of the path taken to travel between these two points. **What is this value and how is it related to f you found in (b)?**