Math 10C
Midterm Exam 2
May 17, 2011
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Version A

Instructions

1. **No calculators or other electronic devices are allowed during this exam.**
2. **You may use one page of notes, but no books or other assistance during this exam.**
3. **Write your *Name*, *PID*, and *Section* on the front of your Blue Book.**
4. **Write the *Version* of your exam at the top of the page on the front of your Blue Book.**
5. **Write your solutions clearly in your Blue Book**
   (a) **Carefully indicate the number and letter of each question and question part.**
   (b) **Present your answers in the same order they appear in the exam.**
   (c) **Start each question on a new side of a page.**
6. **Read each question carefully, and answer each question completely.**
7. **Show all of your work; no credit will be given for unsupported answers.**

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

1. (8 points) Let A and B be the points of coordinates $A = (1, 3, 3)$, $B = (2, 1, 2)$.
   (a) Find the coordinates of the vector $\vec{u} = \overrightarrow{AB}$
   (b) Let $\vec{v} = \vec{i} + \vec{j} - \vec{k}$. Find the coordinates of the point C such that $\overrightarrow{AC} = \vec{v}$.
   (c) Are the vectors $\overrightarrow{AC}$ and $\overrightarrow{AB}$ orthogonal? Justify your answer.
   (d) Find the coordinates of the vector $\vec{w} = \vec{u} \times \vec{v}$

2. (6 points) Let F be the function defined by $F(x, y) = e^{(x-1)^2+y}$.
   (a) Compute algebraically the partial derivatives F_x and F_y.
   (b) What is the equation of the plane tangent to F at the point $(1, 0)$?

3. (6 points) A plane is traveling due north with an airspeed of 725 km/hr while descending at a rate of 75 km/hr. There is a 60 km/hr wind blowing from 30 degrees south of due west. What is the ground speed of the airplane?

4. (6 points) Let $f(x, y) = 2x^2 + 3xy + 5y^2$. At the point $(-2, 1)$:
   (a) Find a unit vector $\vec{u}$ so that the directional derivative $f_{\vec{u}}(-2, 1)$ is maximum.
   (b) Find a unit vector $\vec{u}$ so that the directional derivative $f_{\vec{u}}(-2, 1)$ is minimum.
   (c) Find a unit vector $\vec{u}$ so that the directional derivative $f_{\vec{u}}(-2, 1)$ is zero.