Instructions

1. Write your Name, PID, Section, and Exam Version on the front of your Blue Book.
2. No calculators or other electronic devices are allowed during this exam.
3. You may use one page of notes, but no books or other assistance during this exam.
4. 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 problem on a new page.
5. Show all of your work. No credit will be given for unsupported answers (even if correct).
6. Turn in your exam paper with your Blue Book.

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. (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 $(1, 0)$?

2. (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?

3. (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.

4. (6 points) Let $f(x, y) = x^3 + y^2 - 3x^2 - 2y + 10$. Find and critical points and classify each as a local maximum, local minimum, or saddle point.

(This exam is worth 25 points.)