MATH 251, Fall 2011
EXAM I - VERSION A

LAST NAME (print)_____ FIRST NAME : _____

UIN: _____SEAT#: _____

DIRECTIONS:

- The use of a calculator, laptop or computer is prohibited.
- In all problems present your solutions in the space provided.
- Be sure to read the instructions to each problem *carefully.*
- Use a pencil and be neat. If I can't read your answers, then I can't give you credit.
- *Show all your work* and *clearly indicate your final answer.* You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
- SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED.

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat or steal, or tolerate those who do."

Signature: _____

Good Luck!

DO NOT WRITE BELOW!

page 2	page 3	page 4	page 5	page 6	page 7	Total
14	16	13	21	20	16	100

GRADE:

1. [6pts] Find z_y if the function $z = z(x, y)$ is given implicitly by the following equation

$$ze^{xy+z} = \sin(x + y^4 z) - 2011.$$

2. [8pts] Let $z = y^2 \tan x$ where $x = t^2uv$ and $y = u + tv^2$. Use the Chain Rule to find $\dfrac{\partial z}{\partial v}$ when $(t, u, v) = (5, 1, 0)$.

3. The ellipsoid $x^2 + 2y^2 + z^2 = 4$ intersects the plane $y = 1$ in a circle.

   (a) [4pts] Write down the vector function for this circle (indicate the parameter domain).

   (b) [6pts] Find parametric equations for the tangent line to this circle at the point $(1, 1, 1)$.

   (c) [6pts] Find an equation for the tangent plane to the ellipsoid at the point $(1, 1, 1)$.

4. Given the surface $y^2 + z^2 - x^2 - 6y + 2z + 10 = 0$

   (a) [7pts] Classify the surface reducing the equation to one of the standard forms.

   (b) [6pts] Sketch the surface. Your sketch should be recognizable as the proper type of surface that has the correct orientation along the correct axis and be in the proper place on the correct axis.

5. Given $z = \dfrac{16}{\sqrt{x^2 - y}}$.

(a) [4pts] Find and *sketch* the domain of the given function.

(b) [4pts] Identify the level curves for each of the given function. *You don't need to sketch the graph, just identify the type of curve (line, hyperbola, etc.)*

(c) [7pts] Find the gradient of the given function at the point $(3, 5)$.

(d) [6pts] Find the maximum rate of change of the function at the point $(3, 5)$.

(e) [6pts] Find the directional derivative of the given function at the point $(3, 5)$ in the direction of the vector $\mathbf{u} = \langle -4, 3 \rangle$.

(f) [6pts] Find an equation of the tangent plane to the graph of the given function at the point $(x, y, z) = (3, 5, 8)$.

6. [8pts] Use differentials to approximate the number $\sqrt{0.98}e^{0.04}$.

7. Given the function $f(x, y) = (x^2 + y^2)e^y + 2011$.

   (a) [6pts] Locate the critical points.

   (b) [10pts] Classify the critical points of f (i.e. local maximum, local minimum or saddle).

LAST NAME (print)_____

FIRST NAME (print) _____