LAST NAME:	FIRST NAME:	CIRCLE: Li Minkoff Zweck

1	/9	2	/9	3	/9	4	/12	5	/12	6	/12	7	/12	T	/75

MATH 2415 (Fall 2016) Exam II, Nov 4th

No books or notes! **NO CALCULATORS!** Show all work and give **complete explanations**. Don't spend too much time on any one problem. This 90 minute exam is worth 75 points.

(1) [9 pts] Find the equation of the tangent plane to the surface $z = x^2 + xy + 3y^2$ at the point $(1, 1, 5)$.

(2) [9 pts]
(a) Use a tree diagram to write out the Chain Rule for the composition $z = f(x, y)$, where $x = g(s, t)$ and $y = h(s, t)$.

(b) Use your answer to (a) to find $\frac{\partial z}{\partial t}$ at $(s,\ t) = (2,\ 0)$ where $z = e^{xy}$, $x = s + \cos t$ and $y = s - \sin t$.

(3) [9 pts] Evaluate the double integral $\iint_D e^{-x^2} \, dA$, where D is the region in the xy-plane bounded by $y = 0$, $y = 2x$ and $x = 3$.

(4) [12 pts] Let $f(x, y) = x^2 y$.

(a) Find the maximum rate of change of the function f at the point $(2, 1)$.

(b) In which direction does this maximum rate of change occur?

(c) Find the directional derivative of f at the point $(2, 1)$ in the direction $\mathbf{i} + \mathbf{j}$.

(5) [12 pts] Find the limit if it exists, or show that the limit does not exist.

(a) $\displaystyle\lim_{(x,y)\to(0,0)} \frac{x^4-y^4}{x^2+y^2}$

(b) $\displaystyle\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4}$

(6) [12 pts] Identify the local maximum and minimum values and saddle points of the function

$$f(x, y) = x^2 - 2xy + \frac{1}{3}y^3 - 3y.$$

(7) [12 pts] Use the method of Lagrange Multipliers to find the absolute maximum and absolute minimum of the function $f(x, y) = x^2 + (y - 2)^2$ on the ellipse $x^2 + 2y^2 = 18$. [*Hint: There are 4 critical points.*]

Please sign the following honor statement:

On my honor, I pledge that I have neither given nor received any aid on this exam.

Signature: _____