LAST NAME:	FIRST NAME:	CIRCLE:		
		Zweck 10:00am	Khafizov 11:30am	Khafizov 2:30pm

1 /12	2 /12	3 /12	4 /15	5 /12	6 /12	T /75

MATH 2415 (Spring 2016) Exam II, Apr 1st

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) [12 pts] Let $z = f(x, y) = x^2 + 4xy - y^3 + x + y$.
(a) Find the direction of steepest ascent and the maximum rate of change of f at $(x, y) = (2, -1)$.

Final Answer:

(b) Find the directional derivative of f in the direction of the vector $\mathbf{v} = (-3, 4)$ at the point $(x, y) = (2, -1)$.

Final Answer:

(2) [12 pts] Find the limit if it exists, or show that the limit does not exist.

(a) $\lim\limits_{(x,y)\to(0,0)} \frac{x^2y}{x^2+y^2}$

Final Answer:

(b) $\lim\limits_{(x,y)\to(0,0)} \frac{x^2+2y}{\sqrt{x^2+y^2}}$

Final Answer:

(3) [12 pts] Find $\iint_D xy^2\,dA$ where D is the triangular domain with vertices $(0,0)$, $(2,0)$ and $(2,4)$.

Final Answer:

(4) [15 pts] Find the absolute maximum and absolute minimum of the following function

$$z = f(x, y) = 2xy - 2x^2 - 5y^2 + 4x + 4y - 4$$

on the triangular domain with vertices $(0, 0)$, $(2, 0)$ and $(0, 2)$.

Final Answer:

Use this page if additional space is needed for the solution of Problem 4:

(5) [12 pts] Consider the surface that is parametrized by

$$(x, y, z) = \mathbf{r}(\theta, \phi) = (3 \sin \phi \cos \theta, 3 \sin \phi \sin \theta, 3 \cos \phi).$$

(a) Find an equation of the form $F(x, y, z) = 0$ for this surface.

(b) Sketch the graph of that portion of the surface given above for which $0 \leq \theta \leq \frac{\pi}{4}$ and $0 \leq \phi \leq \frac{\pi}{2}$. Also sketch the grid curves $\theta = \frac{\pi}{8}$ and $\phi = \frac{\pi}{4}$ on the surface.

(6) [12 pts] Use the method of Lagrange Multipliers to find the absolute maximum and absolute minimum of the function $z = f(x, y) = x^2y^2$ subject to the constraint $x^2 + 4y^2 = 1$.

Please sign the following honor statement:

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

Signature: ________________________________