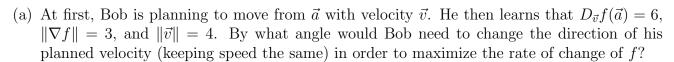
EXAM 2

Math 212, 2019 Summer Term 2, Clark Bray.

Name:	Section:	Student ID:
GENERAL I	RULES	
YOU MUST SHOW ALL WORK AND EXPLAIN AI CLARITY WILL BE CONSIDERED IN GRADING.	LL REASONING	TO RECEIVE CREDIT.
No notes, no books, no calculators.		
All answers must be reasonably simplified.		
All of the policies and guidelines on the class webpage	s are in effect on	this exam.
WRITING F	RULES	
Do not write anything near the staple – this will be cu	it off.	
Use black pen only. You may use a pencil for initial sk drawn over in black pen and you must wipe all erasure	_	
Work for a given question can be done ONLY on the fon. Room for scratch work is available on the back of the end of this packet; scratch work will NOT be grad	this cover page,	
DUKE COMMUNITY STAN	NDARD STAT	EMENT
"I have adhered to the Duke Community Star	ndard in complet	ing this examination."
Signature:		

1.	(20 pts) Suppose that Bob is in \mathbb{R}^2 at the point \vec{a} , and is interested in the values of the differentiable
	function $f: \mathbb{R}^2 \to \mathbb{R}^1$.



(b) Assuming that Bob makes the adjustment described in (a) above, what would be the rate of change of f with respect to time?

(c) Instead assuming that Bob keeps his originally planned velocity \vec{v} , what would be the rate of change of f with respect to distance traveled?

- 2. (20 pts)
 - (a) What is the definition of the directional derivative of the function b at the point \vec{p} with velocity \vec{d} ?

(b) Show that the function $f: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $f(x,y) = (x^2ye^{xy}, xye^{x^3}) = (f_1, f_2)$ is differentiable at the point $\vec{a} = (0,1)$, and find the matrix representing the linear transformation T for which

$$D_{\vec{v}}f(\vec{a}) = T(\vec{v})$$

3. (20 pts) The solid T is the set of all points in \mathbb{R}^3 with $x^2+z^2\leq 4$ and $(y+1)^2\leq 3+x^2$. Set up, but do not evaluate, an iterated integral to compute $\iiint_T y^2\,dV$. (Suggestion: note that " $a^2\leq b^2$ " is equivalent to " $-|b|\leq a\leq |b|$ ".)

4. (20 pts) The region $D \subset \mathbb{R}^3$ is bounded between the graphs of the functions $f(x,y) = (x^2 + y^2)^{1/2}$ and $g(x,y) = x^2 + y^2$, and mass is distributed through D with density $\delta(x,y,z) = (x^2 + y^2 + z^2)$. Compute the total mass in D.

5. (20 pts) A valley is described by the equation $z = x^2$, sitting over the domain $[-1,3] \times [2,5]$ in the xy-plane. A certain type of weed is growing on the sides of the valley, with the number of weeds per unit area given by $(10-z)^2$. Set up, but do not evaluate, an iterated integral that represents the total number of weeds growing in this valley.