

Name: _____

Instructor: _____

Math 20550, Practice Exam 2
March 19, 2019

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for 1 hour and 15 minutes..
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 9 pages of the test.
- Each multiple choice question is 6 points, each partial credit problem is 12 points.
You will receive 4 extra points.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!					
1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
.....					
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
.....					
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
.....					
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
.....					
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

Please do NOT write in this box.	
Multiple Choice	_____
11.	_____
12.	_____
13.	_____
Extra Points.	<u>4</u> _____
Total:	_____

Name: _____

Instructor: _____

Multiple Choice

1.(6 pts) Let $f(x, y)$ be a function where $(1, 3)$ and $(-1, 0)$ are critical points. We also know that $f_{xx}(1, 3) = 1$, $f_{x,y}(1, 3) = 2$, $f_{yy}(1, 3) = 1$ and $f_{xx}(-1, 0) = 2$, $f_{x,y}(-1, 0) = -1$, $f_{yy}(-1, 0) = 3$. Using the second derivative test classify the points $(1, 3)$ and $(-1, 0)$.

- (a) both are local minimums
- (b) $(1, 3)$ is a saddle point; $(-1, 0)$ is a local minimum
- (c) $(1, 3)$ is a saddle point; $(-1, 0)$ is a local maximum
- (d) both are saddle points
- (e) $(1, 3)$ is a local maximum; $(-1, 0)$ is a local minimum

2.(6 pts) Use implicit differentiation to find $\partial z/\partial x$ when $xz + z^2 = y$.

(a) $\frac{\partial z}{\partial x} = \frac{-z}{x + 2z}$

(b) $\frac{\partial z}{\partial x} = \frac{y}{x + z}$

(c) $\frac{\partial z}{\partial x} = \frac{-x}{2z}$

(d) $\frac{\partial z}{\partial x} = \frac{y - z}{x + 2z}$

(e) $\frac{\partial z}{\partial x} = \frac{y - x}{2z}$

Name: _____

Instructor: _____

3.(6 pts) Find the directional derivative of $f(x, y) = xe^{-2y}$ at the point $(1, 0)$ in the direction $\langle 1, 3 \rangle$.

- (a) $\frac{-5}{\sqrt{10}}$ (b) 0 (c) -4 (d) $\frac{-1}{2}$ (e) $\sqrt{10}$

4.(6 pts) Consider the two surfaces $\mathcal{S}_1 : y + z = 4$ and $\mathcal{S}_2 : z = 2x^2 + 3y^2 - 12$. Find the tangent line to the intersection curve of \mathcal{S}_1 and \mathcal{S}_2 at the point $(1, 2, 2)$.

- (a) $\langle x, y, z \rangle = \langle 11t, -4t, 4t \rangle + \langle 1, 2, 2 \rangle$
(b) $\langle x, y, z \rangle = \langle -11t, 4t, -4t \rangle + \langle -1, -2, -2 \rangle$
(c) $\langle x, y, z \rangle = \langle -11t, 4t, -4t \rangle + \langle 1, 2, 2 \rangle$
(d) $\langle x, y, z \rangle = \langle -13t, 4t, -4t \rangle + \langle -1, -2, -2 \rangle$
(e) $\langle x, y, z \rangle = \langle -13t, 4t, -4t \rangle + \langle 1, 2, 2 \rangle$

Name: _____

Instructor: _____

5. (6 pts) Let $f(x, y)$ be a function of $x(s, t) = st$ and $y(s, t) = 2s + t$. If you know that $f_x(1, 3) = 2$ and $f_y(1, 3) = -3$ then what is $\partial f / \partial s$ at when $s = 1$ and $t = 1$?

- (a) -1 (b) not enough information to determine the value
(c) 3 (d) -4
(e) 0

6. (6 pts) Find a point on the surface $z = x^2 - y^3$ where the tangent plane is parallel to the plane $x + 3y + z = 0$.

- (a) no such point exists (b) $(-1/2, 1, -3/4)$ (c) $(1, 1, 0)$
(d) $(-1/2, 1, 1)$ (e) $(-1/2, 1, -5/2)$

Name: _____

Instructor: _____

7.(6 pts) Let f be the function $f(x, y, z) = \sin(xyz)$. From the point $(1, 1, 0)$ in which direction should one move in order to attain the maximum rate of change.

- (a) $\frac{1}{\sqrt{2}}\langle 1, 1, 0 \rangle$ (b) $\langle 0, 0, 1 \rangle$ (c) $\frac{1}{\sqrt{2}}\langle 0, 0, 1 \rangle$ (d) $\langle 0, 0, 0 \rangle$ (e) $\langle 1, 1, 1 \rangle$

8.(6 pts) Find the absolute maximum value of the function $f(x, y, z) = xy + \frac{z^2}{2}$ under the two constraints $y - 2z = 0$ and $x + z = -1$.

- (a) $\frac{22}{9}$ (b) $\frac{-2}{9}$ (c) $\frac{2}{3}$ (d) $\frac{2}{9}$ (e) $\frac{-1}{2}$

Name: _____

Instructor: _____

9.(6 pts) Which of the following integrals represents the volume of the solid delimited by $y = 0$, $y = 1$, $x = 0$, $x = 2$, $z = 0$ and $z = x^2y + y^3$.

(a) $\int_0^2 \int_0^1 (x^2y + y^3) dydx$

(b) $\int_0^2 \int_0^1 (-x^2y - y^3) dx dy$

(c) $\int_0^2 \int_0^1 (-x^2y - y^3) dydx$

(d) $\int_0^2 \int_0^1 (x^2y + y^3) dx dy$

(e) $\int_1^2 \int_0^1 (x^2y + y^3) dydx$

10.(6 pts) Compute $\iint_R 24xy dA$ where R is the region bounded by $x = 1$, $x = 2$, $y = x$, and $y = x^2$.

(a) 62

(b) 128

(c) 64

(d) 48

(e) 81

Name: _____

Instructor: _____

Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(12 pts.) Find the absolute maximum and absolute minimum values of the function $f(x, y) = x - 3y$ subject to the constraint $x^2 + 2y^2 = 3$.

Name: _____

Instructor: _____

12.(12 pts.) Consider the iterated integral $\int_0^2 \int_{y^2}^4 y^3 e^{x^3} dx dy$.

- (a) Sketch the region of integration.
- (b) Rewrite the integral with the order of integration reversed.
- (c) Compute the value of the iterated integral.

Name: _____

Instructor: _____

13.(12 pts.) Determine the absolute maximum and minimum values of the function $f(x, y) = x^2y - xy + x$ on the region $0 \leq x \leq 2$, $-2 \leq y \leq 0$.