Name: ______________________________

Instructor: ___________________________

Math 20550, Practice Exam 2
September 30, 2015

- 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.	4
Total:	________

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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) $\dfrac{\partial z}{\partial x} = \dfrac{-z}{x + 2z}$

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

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

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

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

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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) $\dfrac{-5}{\sqrt{10}}$ (b) 0 (c) -4 (d) $\dfrac{-1}{2}$ (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) $\langle x,y,z \rangle = \langle -13t, 4t, -4t \rangle + \langle 1,2,2 \rangle$

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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) $(-1/2, 1, -5/2)$

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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) $\frac{-1}{2}$

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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) $\int_0^2 \int_0^1 (-x^2y - y^3)\, dxdy$

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

(d) $\int_0^2 \int_0^1 (x^2y + y^3)\, dxdy$

(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) 61

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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 $x^2 + 2y^2 = 3$.

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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.

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