MAT 397 CAL III Section M005 Spring 2016

TEST 2

Your Name (please PRINT): _____

Student ID Number: _____

INSTRUCTIONS

- Fill in the above items.
- There is a total of 5 problems, for a maximum possible total value of 100 points. **Make sure you have all 6 test pages (this cover page + 5 test pages)**. You are responsible to check that your test booklet has all 6 pages. Alert a proctor if your copy is missing any pages.
- **Show all your work.** Only minimal credit will be given for answers without supporting work.
- **Write your answer in the box** at the bottom of pages 2-6.
- **Use the back of test pages if additional space is needed**, and for scratch paper.
- **No calculators or other electronic devices; no outside notes; no outside tables** are allowed on this exam. Any use of calculators or electronic devices, or outside notes is a violation of the Academic Integrity Policy.

Do not write below this line

Pb. #	Max Points	Your Score
1	20	
2	18	
3	18	
4	24	
5	20	
Total	100	

1. (20 pts) Let $f(x, y) = x^2y^2 - x$.

(a) Find ∇f at $(2, 1)$

(b) Use a linear approximation to find the approximate value of $f(1.9, 1.1)$.

Answer for part (a):
Answer for part (b):

2. (18 pts) Find the equation of the tangent plane to the given surface at the specified point

$$x^2 + z^2 + yz = e^{xy}, \qquad (1, 0, 2)$$

Answer:

3. (18 pts) Let $w = ue^v$, where $u = xy$ and $v = x/y$. Using the chain rule, compute $\frac{\partial w}{\partial x}$ and $\frac{\partial w}{\partial y}$ and express them in terms of only x and y.

4. (24 pts) Consider the function

$$f(x, y) = x^3 - xy^2 - 4x^2 + 3x + x^2y$$

(a) Find the maximum value of the directional derivative $D_{\mathbf{u}}f$ at the point $(1, 1)$ as $\mathbf{u}$ varies.

(b) Find the direction $\mathbf{u}$ in which the maximum occurs and $|\mathbf{u}| = 1$.

(c) Find the direction(s) $\mathbf{u}$ for which $D_{\mathbf{u}}f(1, 1) = 0$ and $|\mathbf{u}| = 1$.

Answer for part (a):
Answer for part (b):
Answer for part (c):

5. (20 pts) We want to construct a rectangular box. The material used to build the top and bottom cost \$10/ft^2 and the material used to build the sides cost \$5/ft^2. If the box must have a volume of 16 ft^3, determine the dimensions that will minimize the cost to build the box.

Answer: