MAT203 Calculus III. Midterm Exam 2

11/8/2019

In Memory of Felix Hausdorff (November 8, 1868 - January 26, 1942)

Problem	Points
Problem 1(25pts)	
Problem 2(25pts)	
Problem 3(25pts)	
Problem 4(25pts)	
Total (100pts)	

Note: You are not allowed to use any type of CALCULATORS or CELL PHONES.

Statement of Ethics regarding this exam

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature: _____ Date: _____

Name: (Please print.) _____ ID #: _____

Recitation Day_____
Time _____
TA's Name_____

1.[25pts]

(1) Compute the partial derivatives $\frac{\partial F}{\partial x}$ and $\frac{\partial F}{\partial y}$ of the function

$$F(x, y) = \frac{x}{x^2 + y^2}.$$

(2) Assume that the two-variable function $z = z(x, y)$ is defined implicitly by the equation

$$\ln(x + 2z) + 3xy^2 = 200.$$

Then compute $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ as functions of x, y and z.

1.

2. [25pts]

(1) Compute the gradient of the function $F(x, y, z) = \ln(x + y^2 + z^3)$ at $(1, 0, 1)$.

(2) Let $\boldsymbol{v} = (-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$ and let $F(x, y) = \sin(xy) + e^{xy}$, compute the directional derivative $D_{\boldsymbol{v}}F(x, y)$ at $(0, 0)$.

(3) Find the equation of the tangent plane and the normal line of the surface defined by $xy + yz + xz = 9$ at the point $(1, 1, 4)$.

2.

3. [25pts] Find all the local maxima, local minima and saddle points of the following functions:

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

(2) $f(x, y) = x^3 - y^3 + 3xy + 15$

3.

4.[25pts]

(1) Let $x > 0$, $y > 0$ and $z > 0$ satisfy $x + 2y + 3z = 6$. Compute the maximum of the function $f(x, y, z) = xyz$ under the constraint $x + 2y + 3z = 6$.

(2) Find the maximal and minimal distance from the curve $x^2 + y^2 - xy - 1 = 0$ to the origin $(0, 0)$.

4.

Use this page as scratch paper.

Use this page as scratch paper.

Use this page as scratch paper.