King Saud University
Department of Mathematics
1st Semester 1445 H

MATH 201 (Differential and Integral Calculus)
First Midterm Exam
Duration: 2 Hours

Name		ID	

Question Number	I	II	III	IV	Total
Mark					

[I] [4 *Points*]

1. If $w = cos(x - y) + ln(x + y)$, **show** that $w_{xx} = w_{yy}$

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2. If $w = x^2 + e^{y^2+z}$, **Find** $\frac{\partial^3 w}{\partial z \partial y^2}$

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3. If $z = f(x, y)$ is determined **implicitly** by the equation $xz^2 + x^2y - 4y^2z + 3y = 2$. **Find** $\frac{\partial z}{\partial x}$

[II] [6 *Points*]

1.Let $w = f(x,y) = \begin{cases} \frac{xy^2}{x^2+y^2}, & (x,y) \neq (0,0) \\ 0 \quad , & (x,y) = (0,0) \end{cases}$

(a) **Find** $f_x(0,0)$ and $f_y(0,0)$

(b) **Find** Δw at (0,0)

(c) **Discuss** the differentiability of f at $(0,0)$

2. Use the **differentials** to approximate the change in $w = f(x,y) = x - 3x^4y^2 + 2y^3$

From $(2,3)$ to $(2.02, 2.99)$

[III] [6 *Points*]

1. **Find** the **extrema** and **saddle points** of $f(x,y) = x^4 - 4xy + 2y^2$

2. **Use Lagrange multipliers to** find the **extrema** of $f(x,y,z) = x^2 + y + z$

subject to the constraint $2x^2 + 2y^2 + z^2 = 2$

[IV] [4 *Points*]

Let $w = f(u, v)$ where $u = x - 5t$ and $v = x + 5t$. **Find** $\frac{\partial^2 w}{\partial t^2}$ and $\frac{\partial^2 w}{\partial x^2}$

Good Luck ☺