



Middle East Technical University – Northern Cyprus Campus

**MAT 101 Mathematics for Social Sciences**

Fall 2009/2010

**Final Examination**

13<sup>th</sup> January 2010

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Instructors

Assist. Prof. Dr. Erhan GÜREL and Assist. Prof. Dr. Bertuğ AKINTUĞ

Duration: 120 minutes

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Surname: \_\_\_\_\_

Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Section Number: \_\_\_\_\_

Assist. Prof. Dr. Erhan GÜREL (Section 1)

Assist. Prof. Dr. Bertuğ AKINTUĞ (Section 2)

Q1	Q2	Q3	Q4	Q5	Q6	<b>TOTAL</b>
10 pt.	10 pt.	20 pt.	25 pt.	25 pt.	10 pt.	<b>100 pt.</b>

**Please READ the following remarks before you start the exam.**

- You are not allowed to exchange anything.
- Show all your calculations.
- No partial credit will be given for unsupported answers.

1. (10 pt.) Solve the following system using matrix reduction method.

$$\begin{aligned}x + 2y - z &= -3 \\3x + y + 2z &= 6 \\-2x - 3y + 4z &= 9\end{aligned}$$

2. (10 pt.) Sketch the graph of  $y = x^3 - x$  on the interval  $[-4, 4]$ .

3. (20 pt.) If

$$f(x) = \begin{cases} x^2 & x \leq 1 \\ ax + b & x > 1 \end{cases}$$

a) Find  $\lim_{x \rightarrow 1^-} f(x) =$

b) Find  $\lim_{x \rightarrow 1^+} f(x) =$

c) Find  $\lim_{x \rightarrow 1^-} \frac{f(x) - f(1)}{x - 1} =$

d) Find  $\lim_{x \rightarrow 1^+} \frac{f(x) - f(1)}{x - 1} =$

e) If  $f(x)$  is differentiable, what should be the values of  $a$  and  $b$ .

4. (20 pt.)

a) If  $y = \frac{e^x \ln(4+x)}{(x^2+1)^2(3x+1)^5}$ , find  $y'$  using logarithmic differentiation.

b) If  $y = \log_2(e^{2x} 5x)$ , find  $y'$

c) If  $z = f(x, y)$  and  $\ln(xz) + e^{yz} = xy$ , find  $\frac{\partial z}{\partial y}$

d) If  $f(x, y) = x^2 y \ln y + e^y xy^2 + 1$ , find  $f_{xyx}$

e) If  $y = x^{x^2}$ , find  $y'$

5. (20 pt.) Evaluate the following integrals. If it is improper integral, test for convergence.

a)  $\int_0^1 \int_0^2 6(x^2y^2 + xy + 1) dx dy$

$$\text{b) } \int_1^{\infty} \frac{1}{x\sqrt{x}} dx$$

$$\text{c) } \int \frac{2}{x^3 - x} dx$$

$$d) \int \frac{2x^3}{(x^2+1)^3} dx$$

$$e) \int x^2 \ln x dx$$

6. (10 pt.) Find the area between  $y = |x|$  and  $y = \frac{x+6}{2}$