



Middle East Technical University - Northern Cyprus Campus

**MAT 101 Mathematics for Social Sciences**

Summer 2008/2009

**Final Examination**

14<sup>th</sup> August 2009

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Instructor: Dr. Bertuğ AKINTUĞ

Duration: 115 minutes

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

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

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

Q1	Q2	Q3	Q4	Q5	Q6	Q7	TOTAL
10 pt.	10 pt.	10 pt.	20 pt.	15 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 by using the method of matrix reduction.

$$y + z = -2$$

$$x - z = 2$$

$$x - y = -8$$

2 (10 pt.) Solve for  $x$ :

(a)  $e^{(-2/x)} = 3$

(b)  $\log(x) = \log(x+1) - 1$

3 (10 pt.) Evaluate the limit if it exists.

(a)  $\lim_{x \rightarrow 2} \frac{x^2 - 6x + 8}{2 - x}$

(b)  $\lim_{x \rightarrow \infty} \frac{x(3x + 2)}{5x^2 - 1}$

4 (20 pt.)

(a) Find  $f'(x)$ , if  $f(x) = \ln^3(2x^2 - 2x + 2)$

(b) Find  $f'(x)$ , if  $f(x) = \frac{e^{x^2+1}}{\sqrt{x^2+1}}$

(c) Let  $y = f(x)$ . Find  $\frac{dy}{dx}$  in terms of  $x$  and  $y$  if  $xy^3 + x = y^2 - \ln 2$ .

(d) Find  $\frac{\partial z}{\partial r}$  by using the chain rule if

$$z = f(x, y) = e^{2x+y} \quad \text{where} \quad x = 3r - 1 \quad \text{and} \quad y = 2r + 3$$

**5** (15 pt.) Consider the function  $f(x) = 3x - x^3$ .

**(a)** Find the x-intercept and y-intercept of  $f(x)$ .

**(b)** Find the relative extrema (if any).

**(c)** Find the intervals of concavity, and indicate inflection point(s) (if any).

**(d)** Sketch the graph of  $f(x)$ .

**6** (25 pt.)

**(a)** Find  $\int x^2 \ln x \, dx$  by using the method of integration by parts.

**(b)** Find  $\int \frac{2x^2 - x + 2}{x^2(x+2)} \, dx$  by using partial fractions.

(c) Find  $\int (x^2 + 2x)^3 (x + 1) dx$  by using the method of substitution.

(d) Evaluate  $\int_0^1 \int_0^y x^2 y dx dy$

(e) Test for convergence and indicate if the given integral is divergent or convergent:

$$\int_{-\infty}^{\infty} (5 - 3x) dx$$

7 (10 pt.) Find the area of the region enclosed by the curves  $y = x^2$  and  $y = \sqrt{x}$

(a) Plot the graph of  $y = x^2$  and  $y = \sqrt{x}$  on the same coordinate system and show the area.

(b) Calculate the area.