Middle East Technical University – Northern Cyprus Campus

MAT 101 Mathematics for Social Sciences

Summer 2008/2009

Midterm Examination 2

11th August 2009

Instructor: Assist. Prof. Dr. Bertuğ AKINTUĞ

Duration: 115 minutes

Surname: _____

Name: _____

Student Number: _____

Q1	Q2	Q3	Q4	**TOTAL**
30 pt.	9 pt.	25 pt.	36 pt.	**100 pt.**

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 (30 pt.)

(a) Find $f'(x)$, if $f(x) = \log_2(2x^3 + x)^2$

(b) Find $f'(x)$, if $f(x) = \ln^2(x^2 + x + 1)$

(c) Find $f'(x)$, if $f(x) = x^2 e^{(3x^2-1)}$.

(d) Let $y = f(x)$. Find $\frac{dy}{dx}$ in terms of x and y if $x^2y^2 - 2x + 2y = 12$

(e) Find $y'' = \left(\frac{d^2 y}{dx^2} \right)$ if $xy + y = 2$

(f) Find $y' = \left(\frac{dy}{dx} \right)$ if $y = \frac{4^x \left(x^2 - 1 \right)^3}{x^4 e^{-x}}$

2 (9 pt.) Consider the function $f(x) = 2x^3 + 3x^2$.

(a) Find the critical points of $f(x)$.

(b) Find the absolute maximum and absolute minimum of $f(x)$ on $[-2, 1]$.

3. (25 pt) Let $f(x)=\dfrac{1}{x^2-1}$. Note that $f'(x)=-\dfrac{2x}{\left(x^2-1\right)^2}$ and $f''(x)=\dfrac{2\left(3x^2+1\right)}{\left(x^2-1\right)^3}$

(a) Find the intercepts and check for the symmetry.

(b) Find the asymptotes.

(c) Find the intervals of increase and decrease and relative extremum (if any).

(d) Find the intervals of concavity, and indicate infection point(s) (if any).

(e) Sketch the graph of $f(x) = \dfrac{1}{x^2 - 1}$.

4. (36 pt.)

(a) Find $\int (x-2x^3)(x^2-x^4)^{-5}\,dx$

(b) Find $\int (e^3-2^e)\,dx$

(c) Find $\int \frac{\ln^2 x}{2x} dx$

(d) Find $\int 4x e^{2x} dx$

e) Find $\int \frac{3x^3 + x}{x^4 + x^2} dx$

f) Find $\int \frac{x^2+4x+3}{(x+1)^2}dx$