Petroleum University of Technology
Petroleum Faculty of Ahwaz
Final Exam of 2nd Term of 89-90

Course Title: Applied Mathematics	**Exam Date:** Tir 11, 1390

Exam Time: 180 Min.	**OPEN BOOK**	**Level:** B.Sc☑ M.Sc☐ Ph.D.☐

Student Full Name:	**Student Number:**

1. The function $f(x) = 2x^3 \sin(x^2) - 10\cos(x^2)$ has a local maximum in the interval $1 < x < 2$. Find the coordinates of the maximum point.

2. $y(x)$ is the solution of the initial value problem
$$y' = x\sin(xy) \quad , \quad y(0) = 1$$
$y(x)$ has a local maximum in the interval $1 < x < 3$. Find the coordinates of the maximum point.

3. The following system has a root in the first quadrant; find the coordinates of the root.
$$\begin{cases} x^2 + y^2 = 5 \\ y = e^x - e^y \end{cases}$$

4. The following data are assumed
a) Calculate $f(4)$ as accurate as possible.
b) Calculate $f'(2)$ as accurate as possible.
c) If $f(x) = 0$ calculate x.

x	1	$\dfrac{3}{2}$	2	$\dfrac{5}{2}$	3
y	-13	$\dfrac{-115}{8}$	-11	$-\dfrac{17}{8}$	13

5. The system $\quad \begin{cases} y'' = xy' - y + e^{-x} \\ y(0) \quad , \quad y'(0) = \alpha \end{cases} \quad$ is assumed.

Calculate α such that $y'(3) = 2$

6. Evaluate using three points Gaussian quadrature.
$$\int_{-1}^{1} \int_{-1+2x}^{x+1} \left(e^{-x^2} + y^2\right) dy \, dx$$

Good luck...