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

Course Title: Applied Mathematics		**Exam Date:** Tir 11, 1389
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
$y'=x\sin(xy)$, $y(0)=1$
$y(x)$ 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	$\frac{3}{2}$	2	$\frac{5}{2}$	3
y	-13	$\frac{-115}{8}$	-11	$-\frac{17}{8}$	13

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