Mid Term Exam

Calculus Lab L31+L32   Time: 2:00-3:00 PM

Instructions:

- Please read all the instructions **carefully**, in case of any query, contact me or any scholar.
- This question paper contains **two sets** of questions (Set E and Set O). Check the seat number from the left in your row. If it is an **Even (Odd)** number, answer only **Set E (Set O)** questions.
- Prepare a single PDF of the response (MATLAB Code and Output) of all questions and submit it on LMS Moodle within the given time. Extra time will not be given in any circumstance.

SET E

1. Debug the following MATLAB Code and draw the output **[6]**

```
syms x
f= x^3(x-5)^2
f_x= dif(f,x)
f_xx= dif(fx,x)
D = [0, 5];
l=egplot(f,D)
set(1,'color','h');
holdon
h=egplot(fx,D);
set(h,'colour','r');
e=egplot(fxx,D);
set(e,'colour','g');
legend('f','f_xx','f_x')
```

2. Determine all local minimum and local maximum of $f(x) = \sin x + x - x^3$. Plot the curve and show all the critical points on it. **[10]**

3. Find the volume of the solid generated by revolving the region bounded by $y = \cos x$, $0 \leq x \leq \pi$ about the line $y = 1$. Moreover, plot the function, shade the region and generate the surface of the solid revolution. **[14]**

SET O

1. Find and classify the critical points of the function $f(x, y) = 2(x^2 - y^2) - x^4 + y^4$. Plot the surface in the xyz-space and show all the critical points on it. **[10]**
2. For the function $f(x) = \sin^2 x + \cos x + x^2$, write a MATLAB code to determine slope of tangent line at $x = \pi$. Plot $f(x)$ and its tangent line at $x = \pi$. **[8]**
3. Write a MATLAB code to find the area of the region enclosed by the curve $y = x^3 - 2x^2 - x$ and the line $y = 2x - 2$. Moreover; plot both the curves and shade the required region. **[12]**