Math 229 Calculus Computer Lab Fall 11 Sample Midterm

- You may use only MATLAB during this exam. No calculators.

Problem 1 *(12 pts.)*:
Write a short MATLAB command to generate each of the following sequences.

a. MATLAB command for $10,\ 15,\ 20,\ 25,\ \ldots,\ 300$

b. MATLAB command for 750 *evenly spaced* numbers from 24 to 263

c. Write the MATLAB commands to assign x to be the first 50 square numbers, $x = [1,\ 4,\ 9,\ 16,\ \ldots,\ 2500]$.

Problem 2 *(6 pts.)*:
Write MATLAB commands to plot the horizontal line $y = 25$ for $15 \leq x \leq 40$.
(Make sure it's a solid line, not dots!)

Problem 3 *(12 pts.)*:
Convert the following MATLAB expressions to standard mathematical expressions. Use parentheses to clearly indicate the order of operations:

a. `x-y./x+z`

b. `sin(x)^2/5*sqrt(x)`

c. `(x-y*(z+x))./(y-x)`

Problem 4 *(12 pts.)*:
Convert each of the following expressions to its MATLAB equivalent:

a. x^{y^z}

b. $\dfrac{x}{\frac{y}{z}}$

c. $\dfrac{\arctan^2 x}{8} + \dfrac{5e^{\sqrt{x}}}{3}$

Problem 5 *(10 pts.)*:
Suppose a, b, c are vectors with 100 elements. Each given MATLAB expression has unnecessary dots and/or parentheses. Choose the correct MATLAB expression with the fewest dots and parentheses.
Circle the correct MATLAB expression with the fewest dots and parentheses.

a. `(a.+b).-(b+c)`

1.) `(a+b)-(b+c)`
2.) `a+b-(b+c)`
3.) `a+b-b+c`
4.) `(a+b)-b+c`
5.) `a+(b-b+c)`

b. `6.*(b^5)`

1.) `6*(b.^5)`
2.) `6*b.^5`
3.) `6.*b.^5`
4.) `6.*(b.^5)`
5.) `6.*b^5`

c. `a/(b/c)`

1.) `a/b/c`
2.) `(a/b)./c`
3.) `a./b./c`
4.) `a./(b./c)`
5.) `(a./b)./c`

Problem 6 *(10 pts.)*:
Let $f(x) = 2x^4 - 13x^2 - 30$.

a. Write the commands to compute the roots of $f(x)$ using the `roots` function in MATLAB.

b. How many roots are listed as the output of the `roots` function? _____

c. What are the real root(s) (accurate to 4 decimal places)?

Problem 7 *(15 pts.)*:
Plot the following functions on the interval $(\pi, 6)$.

$$f(x) = \frac{\sin(11x)}{e^x} \qquad\qquad g(x) = \frac{\cos(11x)}{e^x}$$

a. What command generates the x-values?

b. What commands generate the y-values?

c. What command plots the functions together on one graph?

d. What is the number of local minima for each function? (Exclude endpoints)

Number of local minima for $f(x)$ is _____.

Number of local minima for $g(x)$ is _____.

e. What is the number of local maxima for each function? (Exclude endpoints)

Number of local maxima for $f(x)$ is _____.

Number of local maxima for $g(x)$ is _____.

Problem 8 *(15 pts.)*:
Find the minimum (to two decimal places) of $f(x) = \left(\cos(x) + \dfrac{1}{(x-\pi)^2}\right)$ on $(0, \pi)$.
Write the MATLAB commands you used to get your answer.

Problem 9 *(15 pts.)*:
Use MATLAB to find where the following functions are equal (to two decimal places). Write the MATLAB commands, and/or explain how you got your answer.

$$f(x) = 5\cos(3x) \quad \texttt{and} \quad g(x) = -7x + 50$$