MATH.2720 Introduction to Programming with MATLAB   Exam # 1
Spring 2019

Due date: Monday, February 25. Please email me a script file at `stephen_pennell@uml.edu` containing the commands you used to answer these questions.

This is an exam, so the work you submit must be your own. Do not work with anyone else or ask anyone other than me for help.

Problem 1. (10 points)

a) Use MATLAB to evaluate $\sin^2(53°) + \sin^2(37°)$.

b) Use MATLAB to evaluate $\dfrac{e^2}{\ln(3) + \sqrt{17}}$

Problem 2. (10 points)

Use MATLAB to calculate $\vec{u} \times \vec{v}$ and $\vec{u} \cdot \vec{v}$, where $\vec{u} = <1, 2, 3>$ and $\vec{v} = <4, -5, 6>$.

Problem 3. (15 points)

Solve the following system of linear equations.

$$\begin{cases} x_1 + 2x_2 + 3x_3 + 4x_4 &= -10 \\ x_1 - x_3 &= -2 \\ x_2 + 4x_3 - 5x_4 &= 30 \\ 13x_1 + 14x_2 + 15x_3 + 16x_4 &= -34 \end{cases}$$

Problem 4. (25 points)

Graph $y = e^{-x}$, $y = -e^{-x}$, and $y = e^{-x}\sin(2\pi x)$ on the same set of axes for $0 \le x \le 4$.

Please use the following formatting instructions.

- Draw the graph of $y = e^{-x}\sin(2\pi x)$ using a solid blue line, draw the graph of $y = e^{-x}$ using a dotted red line, and draw the graph of $y = -e^{-x}$ using a dotted green line.

- Create a legend to indicate which curve is which. **The only variables in the problem are x and y. Don't use other letters in your legend.** (You will have to use other variable names in your MATLAB code, but your legend should only use the variables x and y.)

- Be sure to label your axes. **The only variables in the problem are x and y. Don't use other letters in your axis labels.**

- Use enough points so your graphs look like smooth curves.

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Problem 5. (20 points)

Generate a figure with a 2×2 array of windows. In the 4 windows graph the following 4 functions over the interval $-2 \leq x \leq 2$: $y = \sinh(x)$, $y = \cosh(x)$, $y = \tanh(x)$, and $y = \operatorname{sech}(x)$. MATLAB knows the hyperbolic functions sinh, cosh, tanh, and sech.

Problem 6. (20 points)

Write a script file that takes a row array x and produces two new arrays, xodd and xeven. The array xodd contains the elements [x(1), x(3), x(5), ...] and the array xeven contains the elements [x(2), x(4), x(6), ...]. (Assume x has already been defined.) For example, if x = [2, 3, 5, 8, 13, 21, 34] your code should produce xodd = [2, 5, 13, 34] and xeven = [3, 8, 21]. Your code should work on arrays of any length.