MATLAB assignment 4

Introduction to Linear Algebra (Week 4) **Fall, 2019**

1. *Graphics in* MATLAB *(continued)*

   (a) In this problem, we plot the **contour lines(level curves)** of a surface which is represented by the equation

   $$z = y \sin x - x \cos y,$$

   over a region in the xy-plane which is defined by $\mathcal{D} = \{(x, y) : -3 \leq x \leq 3, -3 \leq y \leq 3\}$.

   i. Plot contour lines of the given surface, and label the height value of each contour line. One may use the MATLAB command `contour` and `clabel`.

   ii. Using the MATLAB command `meshc` or `surfc`, plot the contour lines together with its 3D surface **in the same figure**.
   [You may use the `hold on` command]

   (b) Considering the items below, plot the contours of the surface and the gradient vector field of the two variable function given by

   $$z = x^2 + y^3 - 5 \sin(xy),$$

   over the region in the xy-plane defined by $\mathcal{D} = \{(x, y) : -3 \leq x \leq 3, -3 \leq y \leq 3\}$.

   i. In order to compute the gradient vector of the function at each point, use the command `gradient`.

   ii. In order to plot the contour lines of the function, use the command `contour`.

   iii. In order to plot the distribution of a vector field at each point, use the command `quiver`.

   iv. In order to plot contours together with the vector field in the same figure, use the command `hold on`.

2. *Symbolic Computation in* MATLAB

   In addition to basic built-in functions of MATLAB, there are many supplementary toolboxes to be used in a variety of numerical computations. In order to use a specific MATLAB toolbox, you are required to install it separately. Fortunately, KAIST TAH license provides nearly 15 toolboxes which have already installed together with your MATLAB. Among these, we use the **Symbolic Math Toolbox** which enables us to do symbolic computation in MATLAB.

   (a) In this problem, we find the roots of the following polynomial:

   $$f(x) = x^6 - 11x^5 + 7x^4 + 163x^3 - 164x^2 - 476x + 480.$$

   i. Using the MATLAB command *syms*, declare a variable x as a symbolic object.

   ii. Using the MATLAB command *factor*, find the factors of the given polynomial.

   iii. Using the MATLAB command *solve*, find the roots of the given polynomial.

   iv. Using the MATLAB command *subs*, check that all the roots obtained from (iii) solve the equation $f(x) = 0$.

3. Read the attachment "MATLAB_Week4.pdf" and practice by yourself.

There is **nothing** to submit in this assignment.
Study and practice by yourself, and please try to make a lot of questions.
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