Name : _____

Homework Project #0

Math 365, Spring 2015

Due Wednesday, January 21

This homework is designed to get you comfortable with using the Matlab environment and with the format for turning in homework.

Here are some guidelines on how you will turn in your homework.

- You will turn in your Matlab m-files all of your homework *electronically* via Dropbox folders that I will assign to you.
- To format your homework, you will use Matlab's Publish markup-language. These are basically formatting commands that can be easily entered into your Matlab scripts. I will then "publish" your homework to produce a PDF file, which I will grade electronically.
- Pay particular attention to the use of the `function` command for each problem, formatting of text, including text formatted using a Times Roman font, italics, bold face and hyperlinks, and the positioning of plots.
- You should publish your own work to make sure that every problem runs to completion. You will only get partial credit for problems that do not execute to completion.

Complete the following problems, using the format suggested by the online solutions (available on the course website). Your final published document should look as close to the solutions as possible. You only have to submit your m-file to your Dropbox folder, but you should also publish your file on your own to see that it is formatted correctly.

1. Compute the area of a circle of radius $R = 4.5$ and store your result in the file `area.dat`.

2. Create two arrays $\mathbf{x}$ and $\mathbf{y}$, whose entries are defined as

$$\begin{aligned} x_i &= i, \quad i = 1, 2, 3, 4, 5. \\ y_j &= 5 - j, \quad j = -2, -1, 0, 1, 2. \end{aligned}$$

   Then, compute the sum of these two vectors in two different ways. First, use a `for` loop to construct the vector $\mathbf{z}$ as

$$z_i = x_i + y_i, \quad i = 1, 2, 3, 4, 5.$$

   Second, "vectorize" this statement as

$$\mathbf{z} = \mathbf{x} + \mathbf{y}$$

   Write your result to the file `z.dat`.

   This problem illustrates one of the most powerful features of Matlab. Many complicated expressions can be vectorized to create code that is faster and more compact than the equivalent version using loops required for other compiled languages.

3. Use *anonymous function handles* to define the functions

$$f(x) = \sin(x) \qquad g(x) = e^x \qquad h(x) = g(f(g(x)))$$

(a) Plot the function over the domain $[-3, 3]$. Use the Matlab command `linspace` to construct a sequence of 500 equally spaced points in the given domain.

(b) Add a title, and axis labels to your plot.

(c) Write the value of $h(4.3)$ to a file `h.dat`.

4. Approximate π using continued fractions. A continued fraction approximation is an expression of the form

$$\pi = d_1 + \cfrac{1}{d_2 + \cfrac{1}{d_3 + \cfrac{1}{d_4 + \cfrac{1}{d_5 + \ldots}}}}$$

The digits you will need to approximate π are given by

$$d = [3, 7, 15, 1, 292, 1, 1, 1, 2, 1, 3, 1, 14, 2, 1, 1, 2, 2, 2, 2, 1, 84].$$

Use the `fprintf` statement to print your approximation, the value of π reported by Matlab's built-in π command, and the error you get in your approximation.

5. (**Extra credit : 5 pts**). Use the *Online Encyclopedia of Integer Sequences* to find the integer sequence A001113 to approximate to e. Print your results as above.

6. Try out some of the more advanced formatting commands by reproducing the text (including hyperlinks) from the homework solutions.