MATH 466 Methods of Applied Mathematics III   **Firstname Lastname**
HW1: (1) #2.5, (2) #2.6, and (3) MATLAB code for example in book (see K drive share folder).

Directions:
There are three problems to complete for this assignment. These three problems are listed above in the header, and are described in more detail below. You will use pencil and paper to write up solutions for the first two problems (as a draft) and you will use MATLAB for the third problem. For all three problems you will use LaTeX (template provided) to create your final document (pdf) to turn in. The LaTeX template and how to turn in your work is described in more detail on the next page of this document.

(1)   For Problem 2.5, do the following.
   a) Use Example 2.4 in the reading as your guide on how to get started and steps to show. The notes and comments from class on Wednesday of Week 2 should also be helpful. For example, you will need to state that $t_0 = 0$ = current time, and let T be the time at which the shell was formed, and so on, as in Example 2.4.
   b) You won't be able to use the steps in Example 2.4 completely, as discussed in class Wednesday, because for the homework you are given "current amount" information, rather than "rate of change" information (from a Geiger counter) as in the reading.
   c) State the relevant IVP and show the separation of variables steps used to obtain the solution given in Example 2.4. See Example 2.1 and the LaTeX template & pdf as a guide.
   d) Show the formula and numbers plugged in that you use to obtain the value of k. Note that this value of k is stated (without work shown) in Example 2.4, so you will be showing the missing steps for this calculation. You will need to look back in the reading for the example in which the formula for k is derived in terms of half-life, which for this problem is $\tau = 5568$.
   e) Show the algebra steps required to derive the formula for T. This was discussed in class on Wednesday of Week 2, so you if you have notes, then you can refer to those as a guide.
   f) Show both the formula for T and the formula with the numbers plugged in, along with the final calculated result. Be sure to include units in your final answer for T.
   g) Note that there is an answer for this problem in the back of the book for you to check, but you need an accurate and well-written solution as outlined in the steps above to support your result.

(2)   Problem 2.6 deals with an interesting and important discovery in archeology. Here is a picture of the Olduvai Gorge from http://www.macroevolution.net/mary-leakey.html.

   In this problem, you will be following the directions given in the book for each part. The work that we did in class on Friday of Week 2 should give you a start to part (a) of this problem. The remainder of the parts will use algebra and some limit-taking from calculus. Writing more steps by hand with pencil and paper will save you time with LaTeX.

(3) MATLAB is used on pages 11-12 of our book to find and plot the numerical solution to the IVP developed in the reading. This MATLAB script can be found in our K drive share folder as ch22expdecay.m, and you will run the script in MATLAB (or Octave). To show your work for this problem, place the code for the script, the command used to run the script, and the output figure produced by MATLAB, into your LaTeX file as demonstrated by the example in the template file.

Using Overleaf (LaTeX):

(1) After completing the work described for the three problems on the previous page, you will use LaTeX to typeset your final document. I will assume that you are using Overleaf (overleaf.com), but other LaTeX editors can be used as long as your work meets the requirements described in this document.

(2) Based on your responses in class, it appears that each of you have experience with LaTeX already. Either way, I have created a LaTeX template for you to adapt and use for this assignment.

(3) To use this LaTeX file, look for 466HW1Template.tex our D2L Homework folder. It is also available in our K drive share folder (both the pdf version and the tex version). This file will need to be uploaded to your LaTeX working folder (directory) that you use for this assignment. If you need a refresher on using Overleaf, the main idea is to first login in (or create an account), then open a blank project and name it HW1.tex. From there, use the upload icon to import the homework template. You won't need the main.tex file that is created by default, so it can safely be deleted.

(4) For MATLAB in LaTeX, you will also need the mcode.sty file for this assignment. You can find this file in our D2L Homework folder and in our K drive share folder. This file will need to be uploaded to your LaTeX working folder (directory) that you use for this assignment. This is also described in the 466HW1Template.tex file. The packages listed in the preamble of the LaTeX template along with this mcode.sty file should work so that your MATLAB code will look nice for this assignment.

(5) In Overleaf, start by renaming the template as HW1LastnameFirstname.tex. If you prefer, you could wait on renaming this until you have a final version of your PDF, but just make sure you don't forget.

(6) Edit and adapt this template for your homework. I believe that the general formatting required for writing up the various problems is covered by the examples given in this template.

(7) The LaTeX template also provides specific directions for how to format your document for certain aspects of this assignment. This includes the use of white space, aligned vertical listings of steps shown, using the \newpage command appropriately, and including captions for your figures, to name a few.

(8) Thus the purpose for my template is not only to give you some support in using LaTeX, but also so that your document meets my formatting requirements.

(9) If you have your own LaTeX template that you have been using for homework in previous classes, check with me about it before you use it for our homework – maybe there is a way to blend the two. As a side note, when publishing papers in a research journal, it is common for the author to be required to use the template provided by the journal. In this way a research journal has a uniform style for each article in the volume, rather than a haphazard collection of formats. This has obvious benefits for the reader.

(10) Your final version of the document should be downloaded in PDF format from Overleaf.

(11) Make sure that that your final version of the pdf file is correctly named (described above in Step 5), and upload this to the corresponding D2L assignment folder.

(12) Your work will be graded according to accuracy, completeness, organization, and how well you follow the steps outlined in this document. The usual A-B-C-D-F criteria will apply for the quality of your work.

(13) Start today and allow for several school days in advance of the deadline for questions.