ENGR 160 Algorithms and Applications Sec 02 Spring 2018

Homework Assignment #5 Due 9:10am Feb 9 (F) 2018

Read Chapter 4 in the book. Work through the examples and practice problems. You do not have to submit any of this work.

Problem 5.1

Write a MATLAB script file to create and return a vector of integers from m to n (where m is the first input argument and n is the second), regardless of whether m is less than n or greater than n. If m is equal to n, the "vector" will just be 1 x 1 or a scalar. Test your program using three different cases, m>n, m<n and m=n, respectively. Attach the results

Problem 5.2

Write a script that will generate one random integer, and will print whether the random integer is an even or an odd number. (Hint: an even number is divisible by 2, whereas an odd number is not; so check the remainder after dividing by 2.)Test your program by running it at least twice, one with an even number, and another with an odd number. Attach the results.

Problem 5.3

In chemistry, the pH of an aqueous solution is a measure of its acidity. The pH scale ranges from 0 to 14, inclusive. A solution with a pH of 7 is said to be *neutral*, a solution with a pH greater than 7 is *basic*, and a solution with a pH less than 7 is *acidic*. Write a script that will prompt the user for the pH of a solution, and will print whether it is neutral, basic, or acidic. If the user enters an invalid pH, an error message will be printed. Test your program by running it five times, with the following inputs: -1; 3; 7; 10; and 18. Attach the results.

Problem 5.4

Whether a storm is a tropical depression, tropical storm, or hurricane is determined by the average sustained wind speed. In miles per hour, a storm is a tropical depression if the winds are less than 38 mph. It is a tropical storm if the winds are between 39 and 73 mph, and it is a hurricane if the wind speeds are >= 74 mph. Furthermore, hurricanes can be categorized based on storm surges, as shown in the table below.

| Category number | storm surge range (feet above normal) |
|---|---|
| 1 | 4-5 |
| 2 | 6-8 |
| 3 | 9-12 |
| 4 | 13-18 |
| 5 | >18 |

Write a script that will prompt the user for the wind speed, and will print what type of storm it is. If it is a hurricane, then your program should prompt the user to enter the storm surge, and will print which category the hurricane is. Your program should print an error message if the user inputs are not in the correct range. Test your program by running it through all possible cases, including an invalid wind speed, and an invalid storm surge. Attach the results.

Problem 5.5

Create and run a MATLAB script file to plot the following function for x over the range of [-2π, 2π] with step size of $0.01\pi$. Show your program and result figure.

$$y(x)=\begin{cases}-1, & x\le -\pi\\ 2\sin^2(x)-1, & -\pi < x \le \dfrac{\pi}{2}\\ 1, & x > \dfrac{\pi}{2}\end{cases}$$