ENGR 160 Algorithms and Applications Sec 02 Spring 2018

Homework Assignment #3 Due 9:10am Jan 26 (F)

Read Section 2.5(pg64-68) of the book and work through the examples and Practice problems given in the book. You do not have to submit any of this work.

Problem 3.1

Write Matlab statements to generate the following vectors using array operations

(1) $[2^3,3^3,4^3,5^3,6^3,7^3,8^3,9^3,10^3]$

(2) $[3^2,3^3,3^4,3^5,3^6,3^7,3^8,3^9,3^{10}]$

(3) $[1^{10},2^9,3^8,4^7,5^6,6^5,7^4,8^3,9^2,10^1]$

(4) $[\frac{1}{1^2 2},\frac{1}{3^2 4},\frac{1}{5^2 6},\cdots\frac{1}{99^2 100}]$

(5) $[1,-\frac{1}{3},\frac{1}{5},-\frac{1}{7}\cdots-\frac{1}{999}]$

Problem 3.2

Write Matlab statements that use the built-in function **sum** to calculate the following summations, each for the first n terms, Your statements should be general for any positive integer values of n. Show your results for n=10.

(1) 3+5+7+9+11+...

(2) $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\square\ \ldots$

(3) $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\square\ \ldots$

(4) $\frac{3}{1}+\frac{5}{2}+\frac{7}{3}+\frac{9}{4}+\ldots$

Problem 3.3

Generate a vector of 20 random integers, each in the range from 50 to 100. Create a variable *evens* that stores all of the even numbers from the vector, and a variable *odds* that stores the odd numbers.

Problem 3.4

Create a vector variable *vec*; it can have any length. Then, write assignment statements that would store the first half of the vector in one variable and the second half in another. Make sure that your assignment statements are general, and work whether *vec* has an even or odd number of elements. If the length of the vector is odd, the element in the middle should be the last element if the first half vector, as well as the first element in the second half vector. Show your results for two different vectors, one with even length, and the other with odd length.

Problem 3.5

Write MATLAB commands to :

1. Create two 4x4 matrices A and B, each has random integer elements whose values are uniformly distributed between -8 and 8.
2. Partition each of them into four 2x2 blocks as shown below.

$$A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}; \quad B = \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}$$

3. Show that matrix addition A+B, matrix subtraction A-B, and scalar multiplication A*5, can be performed block-by-block, and concatenated for the overall result.
4. Show that matrix multiplication A*B can also be calculated block-by-block.

$$A * B = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}$$