MTP 290 PROBLEM SET 1

1. Given the array $A = [2, 4, 1; 6, 7, 2; 3, 5, 9]$, provide the commands needed to:

   (a) assign the first row of A to a vector called x.

   (b) assign the last 2 rows of A to an array called y.

   (c) compute the sum over the columns of A.

   (d) compute the sum over the rows of A.

2. Let matrix A be the same as above (in Problem 1). Observe the output of the following commands:

   (a) rank(A)

   (b) inv(A)

   (c) size(A)

   (d) diag(A)

   (e) eig(A)

   (f) trace(A)

   Note: help command can be used to understand the functionality of any inbuilt function of MATLAB. For example, type,
   $>>$ help trace

3. Given the arrays $X = [1, 4, 8]$, $Y = [2, 1, 5]$ and $A = [3, 1, 6; 5, 2, 7]$, determine which of the following statements will correctly execute and provide the result. If the command will not correctly execute, state why it will not. Using the command whos may be helpful here.

   (a) $X + Y$

   (b) $X + A$

   (c) $X' + Y$

   (d) $A - [X'Y']$

   (e) $[X; Y']$

   (f) $[X; Y]$

   (g) $A - 3$

4. Write down the MATLAB function (.m file) to find the factorial of a positive integer n.

5. Write down the MATLAB function (.m file), which produces the first 20 Fibonacci numbers.

6. Use the bisection method to find the approximation of the root of $f(x) = x^3 - 30x^2 + 2552$, starting from the interval $[0, 20]$ with tolerance 10^{-5}.

7. Use the bisection method to find the solutions accurate to within 10^{-4} for $x^3 - 7x^2 + 14x - 6 = 0$ on $[0, 1]$.

8. Use the bisection method to find the root of $x = \exp^{-x}$ with an accuracy of 10^{-4}. How many iterations did you need?

9. Find the square root of 2 correct up to five decimal places.

10. Use $x_0 = 1$ to find the approximation to the solution to $x^{1/3}$.

11. Use Newton's method to approximate, to within 10^{-3}, the value of x that produces the point on the graph of $y = x^2$ that is closest to $(1, 0)$:
    Hint: Minimize $[\mathrm{d(x)}]^2$, where d(x) represents the distance from $(\mathrm{x, x}^2)$ to $(1, 0)$