ECE 111 - Homework #1

Week #1: Algebra. Due 8am Tuesday, January 18th
Please submit as a Word or pdf file and email to Jacob_Glower@yahoo.com with header ECE 111 HW#1

functions *poly* and *roots*:

1) Use MATLAB, find the roots the the following polynomials:

a) $x^3 + 9x^2 + 26x + 24 = 0$

b) $x^4 + 15x^3 + 80x^2 + 180x + 144 = 0$

c) $x^5 + 15x^4 + 80x^3 + 180x^2 + 144x + 1000 = 0$

2) Use Matlab to multiply our the following polynomials.

a) $(x+5)(x+6)(x+7)(x+8) = 0$

b) $(x-1)(x+1)(x-3)(x+3)(x+4)(x+5) = 0$

Graphing in Matlab

3) Plot the two functions in Matlab and determine all solutions in the range of -4 < x < +4

$$y = x \cdot \cos(2x)$$
$$y = x^2 - 1$$

4) Plot the two functions in Matlab and determine all solutions in the range of -4 < x < +4

$$y = \left(\frac{\sin(3x)}{3x} \right)$$
$$y = 1 - \frac{x}{2}$$

Monte-Carlo Simulations:

Two teams, A and B, are playing a game. Team A has a 70% chance of winning any given game.

5) For Loops: Suppose the two teams play a 9-game match. The match winner is whoever has 5 wins or more. Determine the probability that team A will win the match.

hint: use a for-loop (for i=1:9) and count how many times team A wins during the 9-game match).

6) While Loops: Suppose the two teams play until one team is up by 5 games. Determine the probability that team A will win the match.

hint: use a while-loop and keep looping until one team is up by 5 games.

7) Gauss' Dilema: Play the following game 100 times. (i.e. use Matlab and a for loop along with a while loop)

- It costs $25 to play.   The pot starts at $1.
- Flip a coin. If you get a heads, the pot doubles. If you get a tails, the game is over and you collect the money in the pot.
- Keep flipping until you get a tails.

How much money do you expect to win (or lose) each time you play this game?

Dice:

8a) Determine the probability distribution for the following:

- Roll three 6-sided dice and four 10-sided dice.
- The total is the sum of all of the dice.

   Y = 3d6 + 4d10

8b) What is the probability of the total being 30?

8c) What is the probability of the total being 30 or more?

9) Two people are playing a dice game:

- Player A rolls seven dice and takes the total (3d6 + 4d10)
- Player B rolls two 100-sided dice and takes the lower of the two numbers.
- Whoever has the highest score wins.

Determine the probability that

- A wins
- There is a tie, and
- B wins