

ECE 111 - Homework #1

Week #1: Algebra. Due 11am Tuesday, August 30th

functions *poly* and *roots*:

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

a) $x^3 - 55x^2 + 1004x - 6080 = 0$

b) $x^4 - 24x^3 + 209x^2 - 786x + 1080 = 0$

c) $x^5 + 8x^4 - 49x^3 - 308x^2 + 708x + 2160 = 0$

2) Use Matlab to multiply our the following polynomials.

a) $(x - 4)(x + 3)(x - 10)(x + 9) = 0$

b) $(x - 3)(x - 4)(x - 5)(x - 6)(x + 1)(x + 4) = 0$

Graphing in Matlab

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

$$y = \sin(x) \cdot \cos(3x)$$

$$y = \left(\frac{x(x-2)}{10} \right)$$

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

$$y = (x - 2)(x)(x + 2)$$

$$y = \frac{x}{2} - 2$$

Monte-Carlo Simulations:

Two teams, A and B, are playing a game. Team A has a

- 50% chance of winning any given game (+1 point)
- 20% chance of a tie (+1/2 point), and
- 30% chance of a loss (+0 points)

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 wins the match (5 or more points),
- There is a tie (Team A has 4.5 points), and
- Team A loses (4 points or less)

6) While Loops: Suppose the two teams play until one team is up by 2 points. Determine the probability that team A will win the match.

hint: use a while-loop and keep looping until one team is up by 2 games.

7) Gauss' Dilema: Play the following game 1000 times. (i.e. use Matlab and a for loop along with a while loop)

- It costs \$20 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 five 6-sided dice and five 8-sided dice.
- The total is the sum of all of the dice.

$$Y = 5d6 + 5d8$$

8b) What is the probability of the total being 50?

8c) What is the probability of the total being 50 or more?

9) Two people are playing a dice game:

- Player A rolls five 6-sided and five 8-sided dice and takes the total ($5d6 + 5d8$)
- 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