

ECE 111 - Homework #1

Week #1: Algebra. Due Tuesday, January 17th

Please submit as a hard copy or a Word /pdf file submitted via BlackBoard or email with header ECE 111 HWxx

functions *poly* and *roots*:

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

a) $x^3 - 9x^2 - 49x + 441 = 0$

b) $x^4 - 85x^2 - 60x + 864 = 0$

c) $x^5 - 25x^4 + 144x^3 + 680x^2 - 6800x + 6000 = 0$

2) Use Matlab to multiply out the following polynomials.

a) $y = (x)(x - 10)(x + 7)(x - 7)$

b) $y = (x + 9)(x + 1)(x - 4)(x - 6)(x - 9)(x - 10)$

Graphing in Matlab

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

$$y = \left(\frac{\sin(x)}{x^2+1} \right)$$

$$y = \cos(x)$$

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

$$y = \frac{1}{4} \exp\left(\frac{x}{2}\right) = \frac{1}{4} e^{x/2}$$

$$y = \sin(2x)$$

Monte-Carlo Simulations:

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

- 25% chance of winning any given game (+1 point)
- 30% chance of a tie (+1/2 point), and
- 45% chance of a loss (+0 points)

5) For Loops: Suppose the two teams play a 5-game match. Determine the probability that

- Team A wins the match (A has more than 2.5 points),
- There is a tie (A has 2.5 points), and
- Team A loses (A has less than 2.5 points)

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 three 4-sided dice, four 6-sided dice, and five 8-sided dice.
- The total is the sum of all of the dice.

$$Y = 3d4 + 4d6 + 5d8$$

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 three 4-sided dice, four 6-sided dice, and five 8-sided dice
- Player B rolls two 100-sided dice.
- Whoever has the highest total wins.

Determine the probability that

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