

# ECE 111 - Homework #1

Week #1: Matlab Introduction. Due Monday, January 15th  
Please submit via BlackBoard

## Bison Academy: Homework Sets & Solutions

1) What are the solutions to

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

$$y = \cos(x)$$

hint: See homework #2, problem #4 solutions for Spring 2023

## Roots to a Polynomial

2) Use the *roots()* command to find the roots to

a)  $y = x^3 - 13x^2 + 35x + 49$

b)  $y = x^4 - 26x^3 + 125x^2 + 572x + 420$

c)  $y = x^5 + 15x^4 + 58x^3 - 120x^2 - 1184x - 1920$

## Matlab as a Graphing Calculator: (Thermistor equations)

Assume a thermistor (temperature sensor) and voltage divider have the following relationship:

$$R = 2000 \cdot \exp\left(\frac{4200}{T+273} - \frac{4200}{298}\right) \Omega$$

$$V = \left(\frac{R}{R+4000}\right) \cdot 10V$$

3) Determine the resistance and voltage if

- T = -20 degrees C
- T = +20 degrees C

4) Plot the resistance vs. temperature for  $-20C < T < +20C$ . From the graph, determine

- The temperature if R = 5,000 Ohms
- The temperature if R = 10,000 Ohms

5) Plot the voltage vs. temperature for  $-20C < T < +20C$ . From the graph, determine

- The temperature if V = 8.00 Volts
- The temperature if V = 6.00 Volts

## For-Loops

6) A and B are playing a game

- A rolls five 10-sided dice and takes the sum ( $A = 5d10$ )
- B rolls four 12-sided dice and takes the sum ( $B = 4d12$ ).

Whoever has the higher total wins. Determine the odds that A wins / ties / loses using a Monte-Carlo simulation with 100,000 games.

7) A and B are playing a match. For any given game,

- A has a 55% chance of winning (+1 point for A), and
- A has a 45% chance of losing (+1 point for B).

If the match consists of seven games, determine the odds that A wins the match

- A has 4 or more points

## While-Loops

8) A and B are playing a match. For any given game,

- A has a 55% chance of winning (+1 point for A), and
- A has a 45% chance of losing (+1 point for B).

If the match continues until one player is up by 3 or more games, determine

- The odds that A wins (A has 3 or more points than B)
- Using a Monte-Carlo simulation with 100,000 matches

9) A and B are playing a match. For any given game,

- A has a 55% chance of winning (+1 point for A), and
- A has a 45% chance of losing (+1 point for B).

If the match continues until one player

- Wins at least 4 games, and
- Is up by 2 games

Determine the odds that player A wins the match using a Monte-Carlo simulation with 100,000 matches