

ECE 111 - Homework #1

Week #1: Matlab Introduction

Bison Academy: Homework Sets & Solutions

1) What are the two solutions to

$$y = x + \frac{1}{x}$$

$$y = 5$$

hint: See homework #2, problem #1 solutions for Spring 2025

Roots to a Polynomial

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

a) $y = x^3 + 13x^2 + 50x + 56$

b) $y = x^4 + 34x^3 + 399x^2 + 1854x + 2808$

c) $y = x^5 + 28x^4 + 284x^3 + 1274x^2 + 2403x + 1386$

Matlab as a Graphing Calculator:

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

$$R = 3000 \cdot \exp\left(\frac{3500}{T+273} - \frac{3500}{298}\right) \Omega$$

$$V = \left(\frac{R}{R+10,000}\right) \cdot 10V$$

3) Determine the resistance and voltage if

- T = 5 degrees C (refrigerator)
- T = -20C (freezer)

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

- The temperature when R = 15,000 Ohms
- The temperature when R = 5,000 Ohms

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

- The temperature when V = 6.00 Volts
- The temperature when V = 4.00 Volts

For-Loops

- 6) A and B are playing a game of dice. For each game
- A rolls four eight-sided dice and takes the sum ($A = 4d8$)
 - B rolls three 12-sided dice and takes the sum ($B = 3d12$).

Whoever has the higher total wins the game (A wins on ties). Determine the odds that A wins the game using a Monte-Carlo simulation with 100,000 games.

- 7) Instead of playing a single game of dice, A and B play a match consisting of 5 games. Determine the odds that A wins the match using a Monte-Carlo simulation with 100,000 games.

While-Loops

- 8) Instead of playing a match of 5 games, assume the match continues until one player is up 3 games. Determine the odds that A wins the match using a Monte-Carlo simulation with 100,000 games.

- 9) Instead of playing a match of 5 games, assume the match continues until one player is up 5 games. Determine the odds that A wins the match using a Monte-Carlo simulation with 100,000 games.