

ECE 111 - Homework #1

Week #1: Matlab Introduction - Due Monday, January 20th
(please submit via email or on BlackBoard)

Bison Academy: Homework Sets & Solutions

1) What are the solutions to

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

$$y = (x + 1)(x - 1)$$

hint: See homework #2, problem #2 solutions for Fall 2023

Roots to a Polynomial

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

a) $y = x^3 - 3x^2 - 64x + 192$

b) $y = x^4 - 15x^3 + 23x^2 + 315x - 324$

c) $y = x^5 - 17x^4 + 21x^3 + 837x^2 - 3402x$

Matlab as a Graphing Calculator: (CdS Light Sensor equations)

Assume a CdS light sensor and voltage divider have the following relationship:

$$R = 5000 \cdot (\text{lux})^{-0.6} \Omega$$

$$V = \left(\frac{R}{R+500} \right) \cdot 5V$$

3) Determine the resistance and voltage if

- Light = 30 Lux (dim room)
- Light = 100 Lux (typical room)

4) Plot the resistance vs. light level for $10 < \text{Lux} < 100$. From the graph, determine

- The light level when $R = 900 \text{ Ohms}$
- The light level when $R = 600 \text{ Ohms}$

5) Plot the voltage vs. light level for $10 < \text{Lux} < 100$. From the graph, determine

- The light level when $V = 3.20 \text{ Volts}$
- The light level when $V = 2.20 \text{ Volts}$

For-Loops

6) A and B are playing a match consisting of 5 games. For each game

- A rolls eight 6-sided dice and takes the sum ($A = 8d6$)
- B rolls two 20-sided dice and takes the sum ($B = 2d20$).

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

7) A and B are playing a match consisting of 5 games. For each game,

- A has a 65% chance of winning (+1 point for A), and
- A has a 35% chance of losing (+1 point for B).

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

While-Loops

8) A and B are playing a match consisting of N games. For each game

- A rolls eight 6-sided dice and takes the sum ($A = 8d6$)
- B rolls two 20-sided dice and takes the sum ($B = 2d20$).

Whoever has the higher total wins the game (A wins on ties). The match is over when one player is up three games.

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

9) A and B are playing a match consisting of N games. For each game,

- A has a 65% chance of winning (+1 point for A), and
- A has a 35% chance of losing (+1 point for B).

The match is over when one player is up three games.

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