ECE 111 - Homework #1

Week #1: Matlab Introduction. Due Monday, August 28th
Please submit via BlackBoard

Bison Academy: Homework Sets & Solutions

1) How long does it take for a Vestas V90-2MW wind turbine to pay for itself?

- See homework #4 solutions for Spring 2023

Roots to a Polynomial

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

a) $y = x^3 - x^2 - 6x + 1$

b) $y = x^4 + 5x^3 + 5x^2 - 5x - 6$

c) $y = x^5 - 5x^4 - 10x^3 + 80x^2 - 96x$

Matlab as a Graphing Calculator: (Thermistor equations)

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

$$R = 1000 \cdot \exp\left(\frac{3905}{T+273} - \frac{3905}{298}\right)\Omega$$

$$V = \left(\frac{R}{R+1000}\right) \cdot 10V$$

3) Determine the resistance and voltage if

- T = 0 degrees C
- T = 30 degrees C

4) Plot the resistance vs. temperature for -40C < T < +40C. From the graph, determine

- The temperature if R = 2000 Ohms
- The temperature if R = 5000 Ohms

5) Plot the votlage vs. temperature for -40C < T < +40C. From the graph, determine

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

For-Loops

6) A and B are playing a game

- A rolls three 10-sided dice and takes the sum (A = 3d10)
- B rolls four 10-sided dice and takes the sum (B = 4d10).

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

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

- A has 5 or more points

While-Loops

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

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

If the match continues until one player is up by 2 or more games, determine

- The odds that A wins (A has 2 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 65% chance of winning (+1 point for A), and
- A has a 35% chance of losing (+1 point for B).

If the match continues until one player

- Wins at least 5 games, and
- Is up by 3 games

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