



FLORIDA INTERNATIONAL UNIVERSITY

**Home Project #4
Functions, Loops**

Victor Mendoza
ID: 6348908

EML480 Introduction to Mechatronics
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Introduction:

This project uses the Raspberry Pi Pico to evaluate and display the function

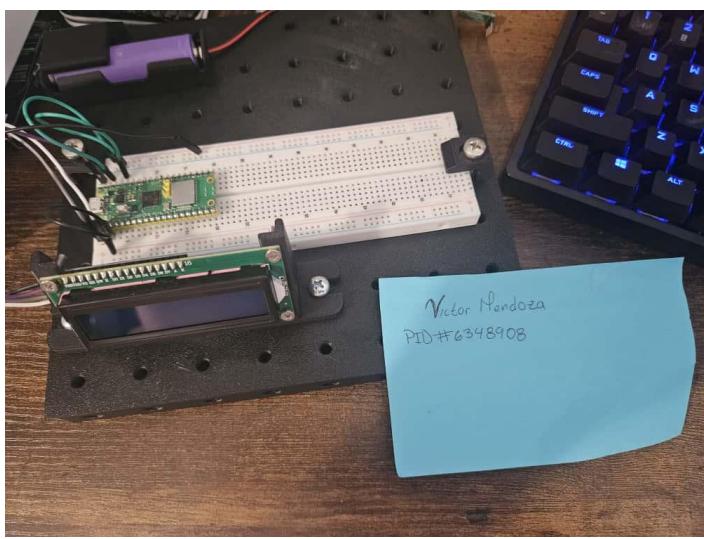
$$y = \frac{6}{x^3} + \frac{15}{x \cdot \sin(x)}$$

within the interval $0.1 \leq x \leq 0.5$ with a step of 0.02. The calculated values of x and y are stored in lists and sequentially displayed on an LCD screen. The program also determines and displays the minimum and maximum values of the function, demonstrating both computational processing and real-time display using the Pico and LCD interface.

Materials used:

1. Pico Board
2. LCD Screen
3. Hook-up wires
4. Breadboard
5. Wires

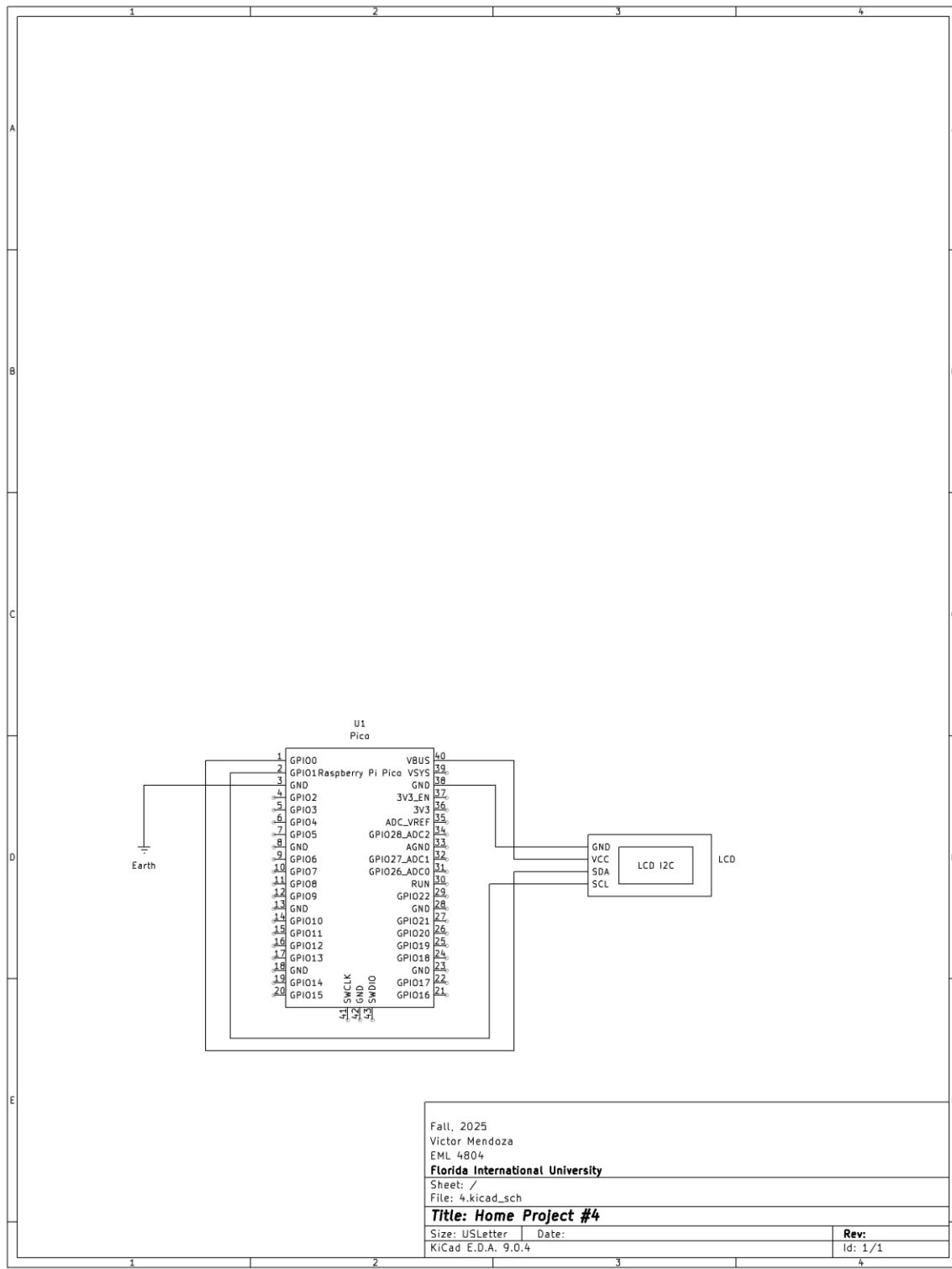
Picture:



Video link:

<https://youtu.be/XXigqjFl8mU?si=w6a7ocoJ-LgObM9I>

Diagram:



Code:

```
import math
def func(x):
    return 6 / (x**3) + 15 / (math.sin(x) * x)
```

```
#Parameters
```

```
xstart = 0.1
```

```
xend = 0.5
```

```
xstep = 0.02
```

```
xlist = []
```

```
ylist = []
```

```
x = xstart
```

```
while x < xend + xstep:
```

```
    y = func(x)
```

```
    xlist.append(x)
```

```
    ylist.append(y)
```

```
    x = x + xstep
```

```
ymax = max(ylist)
```

```
ymin = min(ylist)
```

```
print(ymax)
```

```
print(ymin)
```

```
#Display
```

```
from lcd1602 import LCD
```

```
import utime
```

```
lcd = LCD()
```

```
lcd.clear()
```

```
utime.sleep(2)
```

```
for i in range(len(xlist)):
```

```
    print(i)
```

```
    m = f'X = {xlist[i]:.2f}\nY = {ylist[i]:.3f}'
```

```
    lcd.message(m)
```

```
    utime.sleep(2)
```

```
    lcd.clear()
```

```
lcd.clear()
m = f"Ymin = {ymin:.3f}\nYmax = {ymax:.3f}"
lcd.message(m)
utime.sleep(10)
lcd.clear()
```

Conclusions:

The function was successfully computed and displayed on the LCD across the specified interval. The results confirmed correct evaluation of the function, accurate storage of values in lists, and proper sequential display of outputs. The program also identified and displayed the maximum and minimum values, which matched the expected results when verified against manual calculations. The project validated both the computational capability of the Pico and its ability to interface with an external LCD for presenting mathematical data.

References:

- Raspberry Pi Pico Library: <https://github.com/ncarandini/KiCad-RP-Pico/tree/main>
- How to use a breadboard <https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard/all>
- Raspberry Pi Pico usage
<https://www.raspberrypi.com/documentation/microcontrollers/pico-series.html>
- LCD wiring instructions https://docs.sunfounder.com/projects/thales-kit/en/latest/micropython/liquid_crystal_display.html