Nucleate boiling point test

Lab 5 section 575 individual

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Purpose:
The purpose of this document is to outline the pre-programming process for the heat flux lab. Heat flux is essentially heat transfer or permissibility. This is a logarithmic linear interpolation of points thus "traditional" linear interpolation methods will not work.

Steps:

1) Take user input of positive number less than the max point we interpolate out equations with
2) Generate a piecewise equation
3) Plug user input into piecewise
4) Output

Variables:
List of vars include,
in1: user input

Curve 1 with attributes x0,x1,y1,y0 with m consequently calculated on instantiation

Curve 2 with attributes x0,x1,y1,y0 with m consequently calculated on instantiation

Curve 3 with attributes x0,x1,y1,y0 with m consequently calculated on instantiation

Curve 4 with attributes x0,x1,y1,y0 with m consequently calculated on instantiation

Union 1 with attributes 1.3, 1000
Union 2 with attributes 5, 7000
Union 3 and for etc

Object piecewise that handles and iterates through a list of the x values to determine which equation to use. Curves are passed as parameters

Eg of super structure for readability

```
c1 = Curve(1.3, 5, 1000, 7000)
c2 = Curve(5, 30, 7000, 1500000)
c3 = Curve(30, 120, 1500000, 25000)
c4 = Curve(120, 1200, 25000, 1500000)

piec = PieceWise(c1,c2,c3,c4)

piec.addUnions(1.3, 1000)
piec.addUnions(5, 7000)
piec.addUnions(30, 150000)
piec.addUnions(120, 25000)
piec.addUnions(1200, 1500000)

in1 = float(input("Enter the excess temperature: "))

if 1200 >= in1 > 0:
   print(f"The surface heat flux is approximately {round(piec.getValue(in1))} W/m^2")
else:
   print("Surface heat flux is not available")
```

Input:
The user will input a numerical value that represents the excess heat that the substrate, in this case water, is under.

Calculation:

A formula will interpolate temperatures within the range of the X values listed below. Using a logarithmic scale we will make a piecewise equation.

A: (1.3, 1000)

B: (5, 7000)

C: (30, 1.5x10^6)

D: (120, 2.5x10^4)

E: (1200, 1.5x10^6)

$$y = y_0\left(\frac{x}{x_0}\right)^m, \; m = \frac{loglog\left(\frac{y_1}{y_0}\right)}{\mathrm{log}log\left(\frac{x_1}{x_0}\right)}$$

Table usage: Using a range of values we can test the edge cases to ensure our program's piecewise equation caters to all necessary and correct values.

Test	Excess Temp C	Output
1	5	7000
2	1.3	1000
3	30	1500000
4	120	25000
5	1200	1500000
6	-6	NONE
7	0	NONE
8	25	868760
9	109	33209

10	200000	NONE

Additional considerations:

This is a piecewise equation since points are interpolated and there isn't a unitary equation in use. This means we must consider the cases for the break points.

We will use a total of 4 equations with the special cases for unions.

Pseudo code:

If value is between values that make up equation x use that equation
If value falls on a union point, return the specified value from the chart
If the value is not positive or is above the max point given, exit the code.