Table of Contents


```
function[min_lengthVec] =
 PS09_fin_revisit_jchapla_rbehl(min_diam,max_diam,conduct)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% This function uses loops to find a vector of minimum rod lengths for
 cooling rods in a
% computer, given a minimum diameter, max diameter, and thermal
% conductivity for the material being used.
%
% Function Call
% function[min_lengthVec] =
 PS09_fin_revisit_jchapla_rbehl(min_diam,max_diam,thermalC)%
% Input Arguments
% 1. min_diam //minimum user input diameter
% 2. max_diam //max user input diameter
% 3. thermalC //thermal conductivity
%
% Output Arguments
% 1. min_lengthVec //vector of the minimum rod lengths
%
% Assignment Information
%   Assignment:   PS 09, Problem 2
%   Team ID:   008-14
%   Paired Partner:  John Chapla, jchapla@purdue.edu
%   Paired Partner:  Ranjan Behl, rbehl@purdue.edu
%   Contributor:  Name, login@purdue [repeat for each]
%   Our contributor(s) helped us:
%     [ ] understand the assignment expectations without
%         telling us how they will approach it.
%     [ ] understand different ways to think about a solution
%         without helping us plan our solution.
%     [ ] think through the meaning of a specific error or
%         bug present in our code without looking at our code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Initializes initial values for variables

INITIALIZATION

Temperature near the heat source

```
Tb = 373; %degrees K
% Ambient Air temp
air_temp = 298; %degrees K
% Heat transfer coefficient
h = 100;
% Loop/vector position update counter
counter = 1;
% Initial minimum length of a rod
min_length = 0;
% Temp of rod at given length from heat source (starts at heat source)
T = Tb;
```

Performs calculations for the dimensions of a rod, determines if the inputs are valid, and executes a loop that performs calculations and creates final vector.

CALCULATIONS

Numbe of elements the final vector will have

```
num_vec = max_diam / 0.5;
% Vector of zeros created using the dimension found above
min_lengthVec = zeros(1,num_vec);
% Vector updated in the loop with each diameter
diameter_vec = zeros(1,num_vec);

% If/else to determine if inputs are valid
if(min_diam < 0 || conduct < 0 || max_diam < 0)
    min_length = -1;
    fprintf("One of the inputs is invalid, all must be >= 0");
else
    while  (min_diam < max_diam)
        radius = min_diam / 2;
        circum = 2 * pi * radius;
        area = pi * radius.^2;
        m = sqrt((h * circum) / (conduct * area));

        min_length = (log((T + air_temp) / (Tb - air_temp))) / m;
        T = air_temp + (Tb - air_temp) * exp(-m * min_length);
        min_lengthVec(counter) = min_length;
        diameter_vec(counter) = min_diam;
```

```
        min_diam = min_diam + 0.5;
        counter = counter + 1;
    end
end

% Prints the rod diameters and associated lengths
fprintf("The rod diameters and minimum rod lengths are shown in the
 array below. The diameters are above their associated lengths\n");
final_vec = [diameter_vec;min_lengthVec]
```

```
The rod diameters and minimum rod lengths are shown in the array
 below. The diameters are above their associated lengths
final_vec =
  Columns 1 through 7
    1.0000    1.5000    2.0000    2.5000    3.0000    3.5000    4.0000
    1.5687    1.8296    2.1142    2.3637    2.5893    2.7968    2.9899
  Columns 8 through 14
    4.5000    5.0000    5.5000    6.0000    6.5000    7.0000    7.5000
    3.1712    3.3428    3.5059    3.6618    3.8114    3.9552    4.0941
  Columns 15 through 20
    8.0000    8.5000    9.0000    9.5000         0         0
    4.2283    4.3585    4.4848    4.6077         0         0
```

Shows the outputs in the command window from tests

COMMAND WINDOW OUTPUT

PS09_fin_revisit_jchapla_rbehl(1,10,205) The rod diameters and minimum rod lengths are shown in the array below. The diameters are above their associated lengths

final_vec =

```
Columns 1 through 13

           1.0000    1.5000    2.0000    2.5000    3.0000    3.5000    4.0000    4
           1.5687    1.8296    2.1142    2.3637    2.5893    2.7968    2.9899    3

Columns 14 through 20

           7.5000    8.0000    8.5000    9.0000    9.5000         0         0
           4.0941    4.2283    4.3585    4.4848    4.6077         0         0
```

Calls Academic Integrity Statement

ACADEMIC INTEGRITY STATEMENT

```
PS07_integrity_rbehl(["John Chapla","Ranjan Behl"]);
```

```
We are submitting code that is our own original work. We have not
 used
source code, either modified or unmodified, obtained from any
unauthorized source.  Neither have we provided access to
our code to any peer or unauthorized source. Signed,
 <John Chapla>
 <Ranjan Behl>
ans =
  Columns 1 through 7
    1.5687    1.8296    2.1142    2.3637    2.5893    2.7968    2.9899
  Columns 8 through 14
    3.1712    3.3428    3.5059    3.6618    3.8114    3.9552    4.0941
  Columns 15 through 20
    4.2283    4.3585    4.4848    4.6077         0         0
```

Published with MATLAB® R2018b