II)HEURISTIC ALGORITHM (BASED ON AVERAGE SLOPE PARAMETER)

The *Mathematica* Code for determining the Breaking Temperature for IF and RALS Data Sets by the Heuristic Algorithm Model is as follows:

```
BreakingPoint[datalist_] := (
    k = 0;
    AverageSlope = 0.0;
    AverageSlope =
     Mean[Table[datalist[[i + 1, 2]] / datalist[[i, 2]], {i, 1, Length[datalist] - 1}]];
    Truth1 = Table[If[(datalist[[i + 1, 2]] / datalist[[i, 2]]) ≥ AverageSlope, k = k + 1, k = 0 ],
      {i, 1, Length[datalist] - 1}];
    p1 = Position[Truth1, Max[Truth1]] - Max[Truth1] + 1;
    datalist[[p1[[1]]]];
    ClearAll[k, t, i];
    {{t}} = p1;
    t;
    datalist[[t, 1]]
   );
```

The steps in this code are as follows;

```
k = 0;
AverageSlope = 0;
```

Firstly set two variables, k and AverageSlope respectively. Also assign the 0 value to them to clean the unpredicted or previous value in the assigned memory address.

```
AverageSlope = Mean[Table[rals3[[i + 1, 2]] / rals3[[i, 2]], {i, 1, Length[rals3] - 1}]]
```

```
1.12304
```

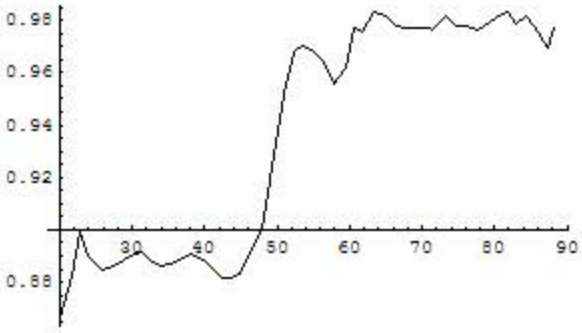
The purpose of this line is just like its name, to get the average slope value of rals3 list and assign this valule to variable "AverageSlope".

```
Truth1 = Table[If[(rals3[[i + 1, 2]] / rals3[[i, 2]]) ≥ AverageSlope, k = k + 1, k = 0 ],
  {i, 1, Length[rals3] - 1}]
```

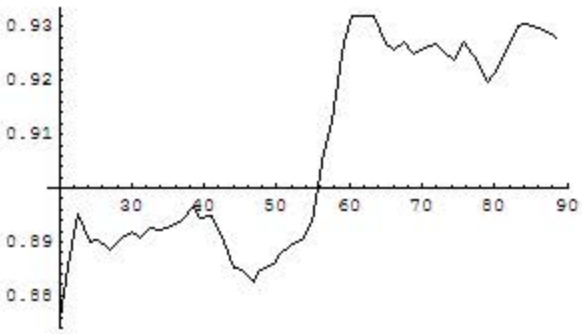
```
{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 2, 3, 4, 0, 0, 0, 0, 0}
```

The function of this line is to generate a new list (named by Truth1) containing the location of the biggest ramp, also called the longest ramp, which is represented by the scores (continued number series). The criteria of determining which point was given the 0 value or given the accumulated number depends on if the slope value of each pair of points is greater than the average slope value. In this case (rals3), the location of value 1,2,3,4 just showed the possible location of the biggest ramp.

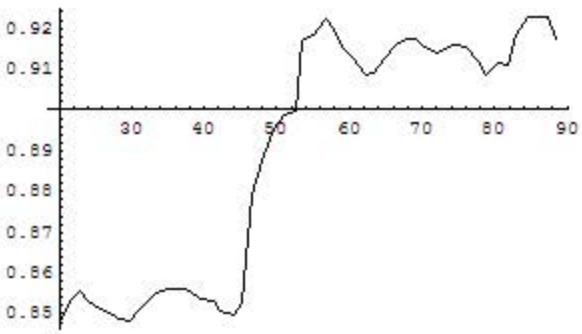
```
rals3 = {{18.6841, 0.5566405}, {18.6426, 0.566864},
   {24.8438, 0.5314635}, {26.4349, 0.538025}, {27.9
   {39.48, 0.5305485}, {41.5796, 0.520935}, {43.919
   {61.9495, 0.4896545}, {64.1827, 0.4930115}, {66.
   {82.5763, 9.99878}, {84.4635, 9.99878}, {86.2494
ListPlot[rals3, PlotJoined → True]
```



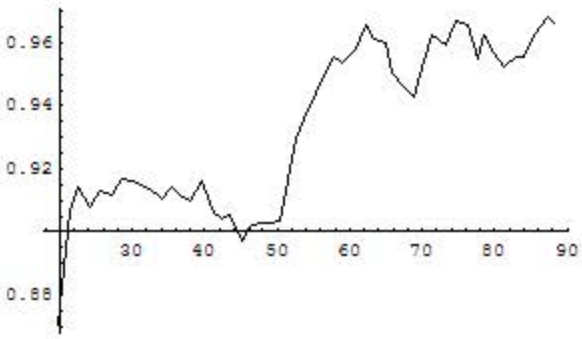
- Graphics -



- Graphics -



- Graphics -



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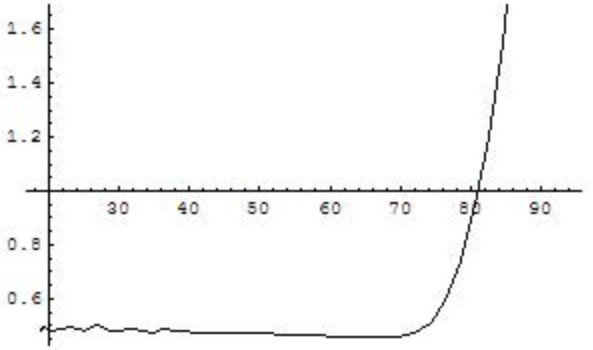
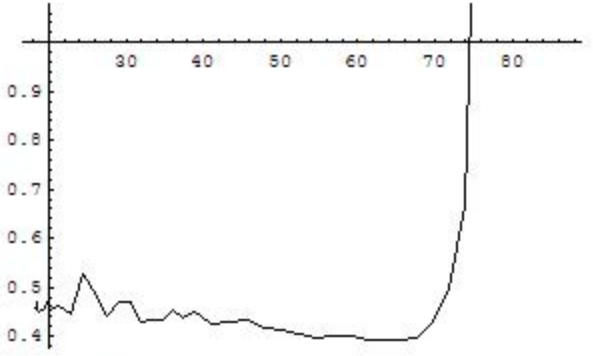
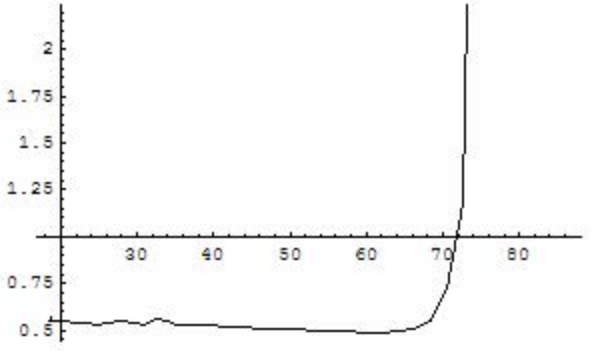


- Graphics -



- Graphics -



- Graphics -

Conclusion

There is still scope for modification in these methods to increase their accuracy.

The results (breaking temperatures for the data sets)by the two methods are tabulated below with the breaking temperatures that were provided .

DataSet	Given	Least Squares Method	Heuristic Model
sfIF1	40	41.8	45.0
sfIF2	42	37.75	46.8
sfIF3	39	43.05	44.0
sfIF4	41	40.45	50.5
rals1	Not given	75.36	72.04
rals2	Not given	66.56	69.86
rals3	Not given	65.23	68.37