DAA Experiment-1-A
(Batch-A/A1)

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Experiment Number	1-A
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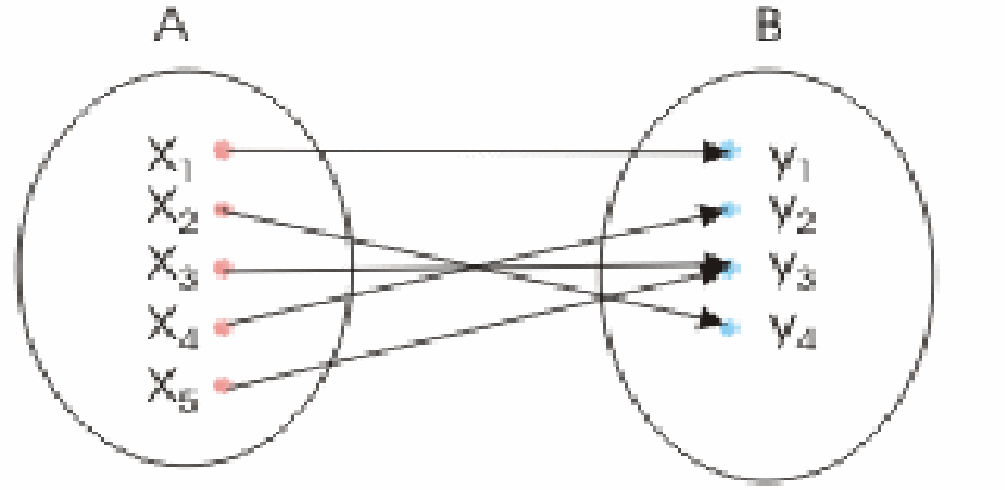
Aim:
To implement the various linear and non-linear functions.

Problem Definition and Assumptions:
From the given list of functions, implement at-least 10, print the input-output table and plot the graphs. Write your observations.

Theory:
A function in the context of this experiment is a mathematical expression that gives certain outputs based on the inputs provided. A proper understanding of functions in general and their nature would help us while dealing with the time complexities of algorithms. It would help us to compare two or more algorithms in the process of determining the most efficient one.



The image above shows a conceptual view of a function. Basically, inputs are mapped to outputs in a function such that one input will have only one output. However, an output may be generated by two or more inputs.

Algorithms:

[A] For log functions-

I. Call the log function from the 'math.h' header file.

II. Wherever log to the base x is asked, divide the answer obtained in the previous step by log(x) and return the obtained value.

[B] For other functions-

I. Simply call the required function from the math header file and return the obtained value.

[C] For factorial function-

I. Return the provided number multiplied by factorial of a number one less than the given number till 0 is reached where 1 is returned.

Program:

```
#include<stdio.h>
#include<math.h>

//utility functions
double factorial(double n){
    if(n<=1)
        return 1;
    return n*factorial(n-1);
}

double func1(double x){
    return pow(1.5,x);
}

double func2(double x){
    return pow(x,3);
}

double func3(double x){
    return log(log(x));
}

double func4(double x){
    return log(factorial(x))/log(2);
}

double func5(double x){
    return exp(x);
}

double func6(double x){
```

```
    return log(log(x)/log(2))/log(2);
}

double func7(double x){
    return x;
}

double func8(double x){
    return pow(2,pow(2,x));
}

double func9(double x){
    return x*pow(2,x);
}

double func10(double x){
    return log(x)/log(2);
}

double func11(double x){
    return factorial(x);
}

//main function
void main(){
    for(double i=0; i<=100; i++){
        printf("%.0lf\t%.2lf\n",i,func1(i));
    }
}
```

Note that in the main() function, all the 11 functions(including the factorial function) were executed one after the other and their outputs were copied in an excel file for obtaining their respective graphs.

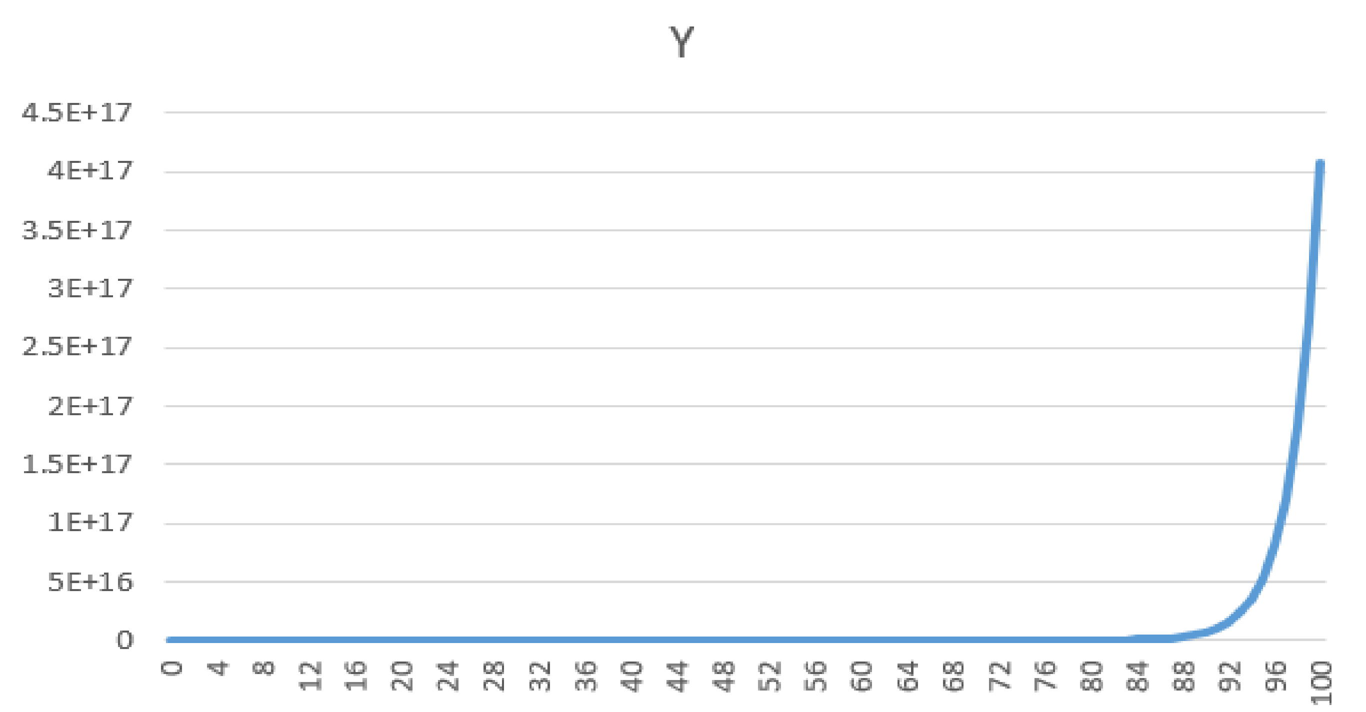
Implementation:

From the given list of functions, the following ten functions were chosen for execution. The corresponding graph obtained and observation for each of the chosen functions are included as well.

The graphs were obtained through the excel file, the screenshots of which are included at the end of the document.

All the x-y values of the functions were pasted from the terminal to the file in order to be able to obtain their respective graphs. In total, eleven functions were executed.

[A] Function-1: $\left(3/2\right)^n$

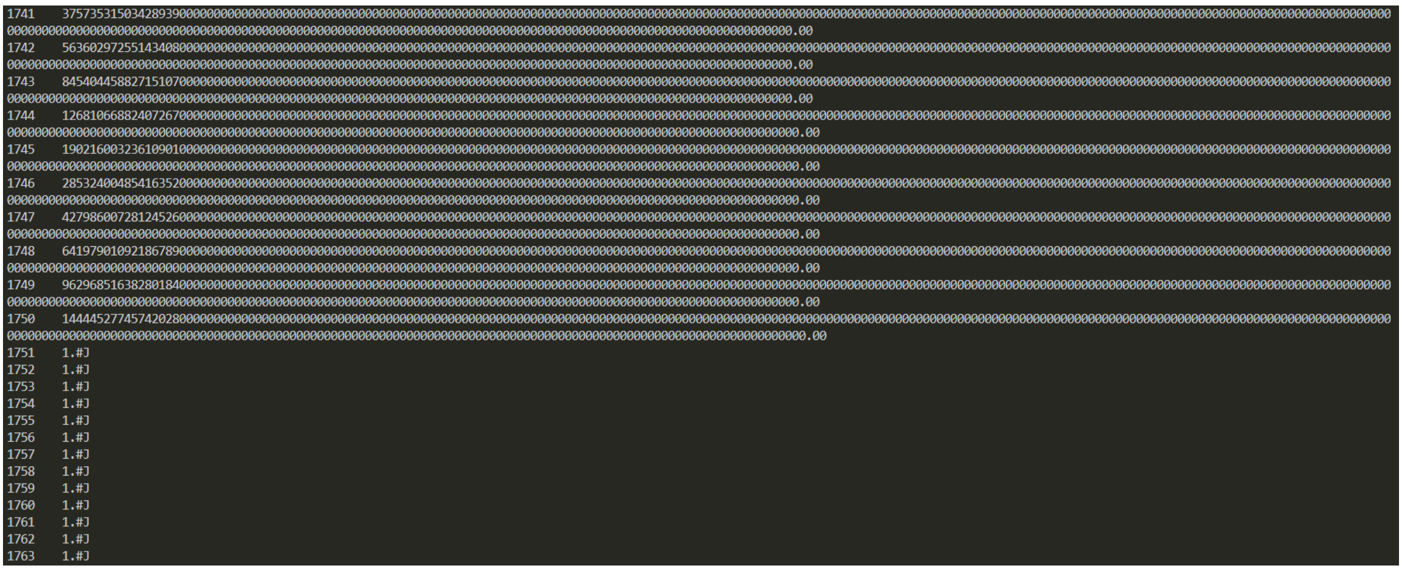


Observations-

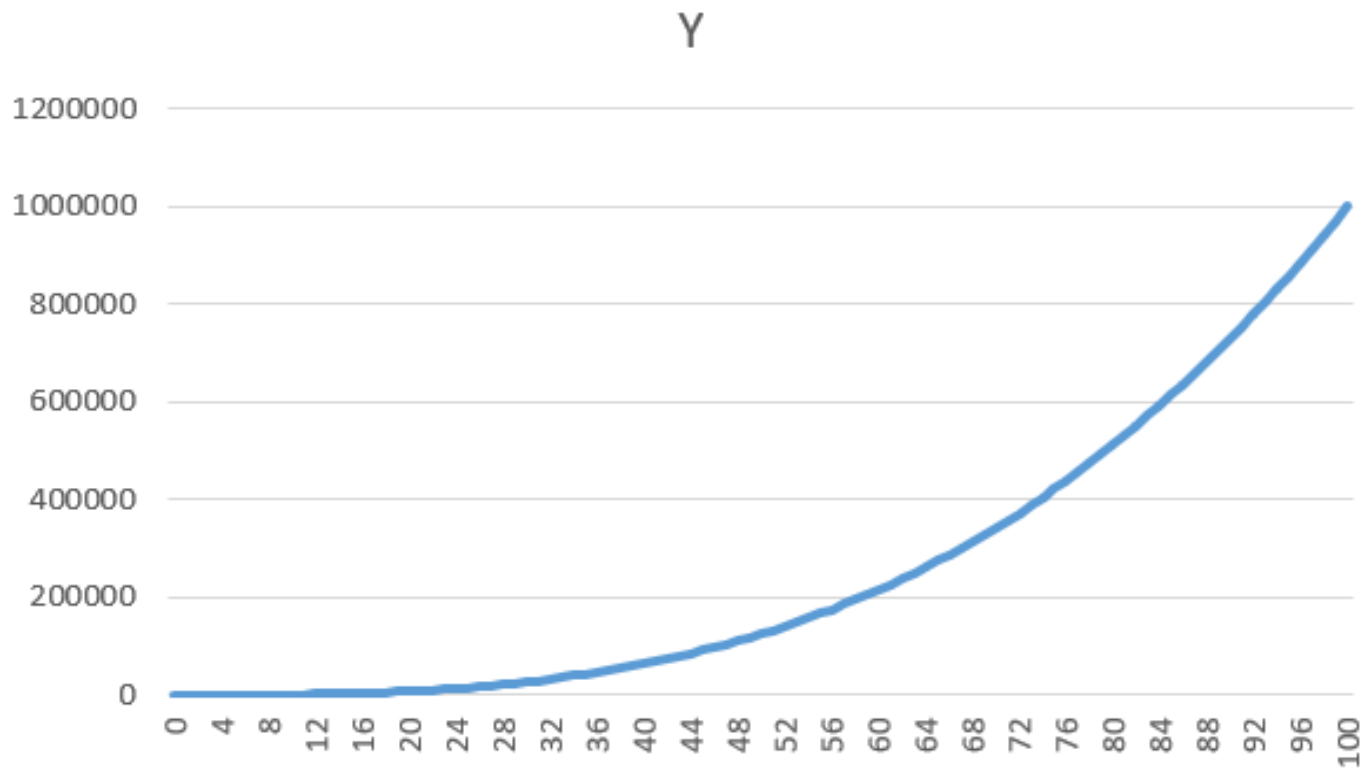
I. The graph seems to have a sudden steep rise thereby indicating that we are dealing with an exponential function.

II. During the runtime of the function on the terminal, it took comparatively more and more time to get the corresponding y value for an x value.

III. By executing the function for values beyond 100, it was observed that a proper output was obtained for values of x up to 1750 after which vague values were obtained. The following image shows the output obtained when the function was executed for values beyond 1750.



[B] Function-2: n^3

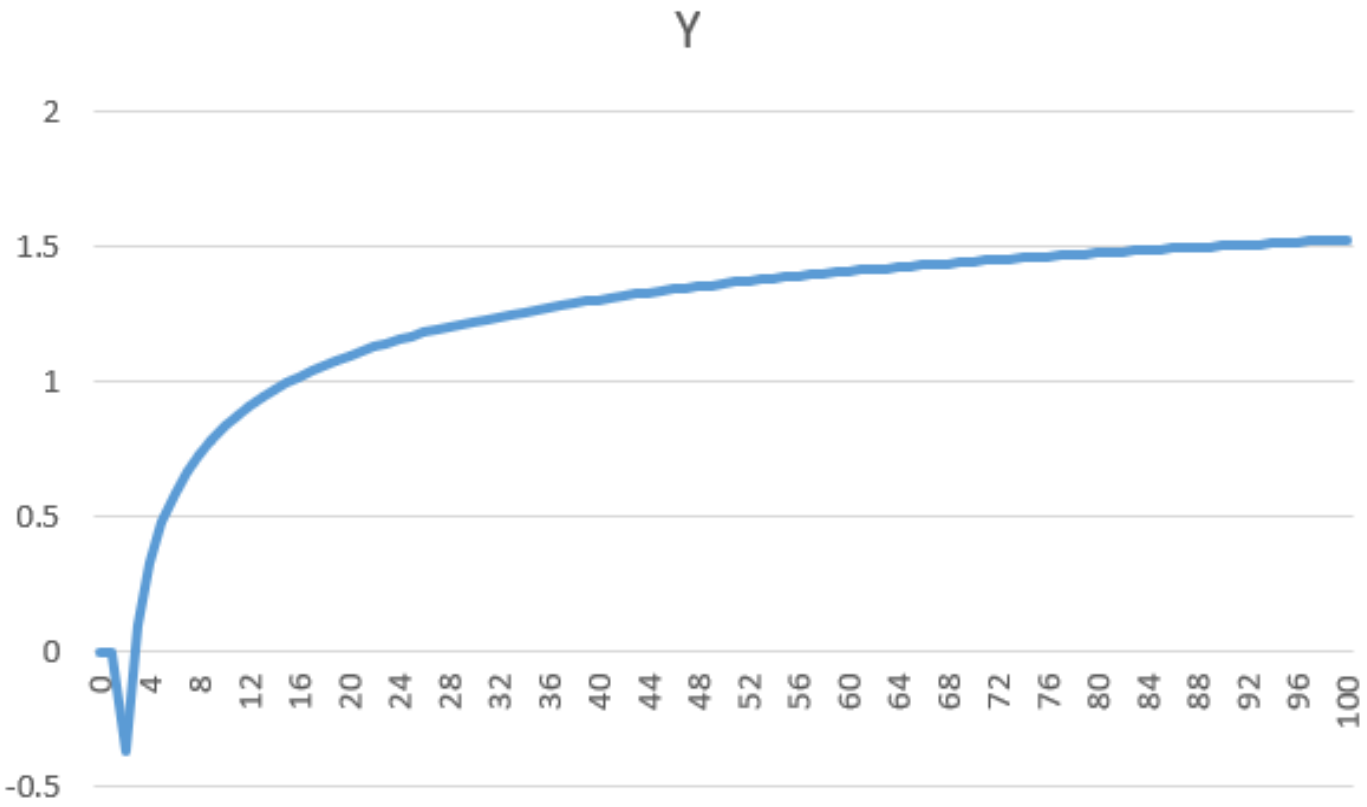


Observations-

I. The graph of the function smoothly increases without any sudden rise or fall as seen above.
II. The curve is concaving in the upwards direction.
III. The function, upon its execution with values much larger than 100, still provides a proper output within the split of a second. The image below shows the output obtained when the function is executed for values in the range of a million.

```
1000963 1002891783000056300.00
1000964 1002894788783841300.00
1000965 1002897794573632100.00
1000966 1002900800369428700.00
1000967 1002903806171231100.00
1000968 1002906811979039200.00
1000969 1002909817792853200.00
1000970 1002912823612673000.00
1000984 1002954905720763900.00
1000985 1002957911630671600.00
1000986 1002960917546585200.00
1000987 1002963923468504800.00
1000988 1002966929396430300.00
1000989 1002969935330361700.00
1000990 1002972941270299000.00
1000991 1002975947216242300.00
1000992 1002978953168191500.00
1000993 1002981959126146700.00
1000994 1002984965090107800.00
1000995 1002987971060074900.00
1000996 1002990977036047900.00
1000997 1002993983018027000.00
1000998 1002996989006012000.00
1000999 1002999995000002900.00
1001000 1003003001000000000.00
```

[C] Function-3: $\ln(\ln n)$

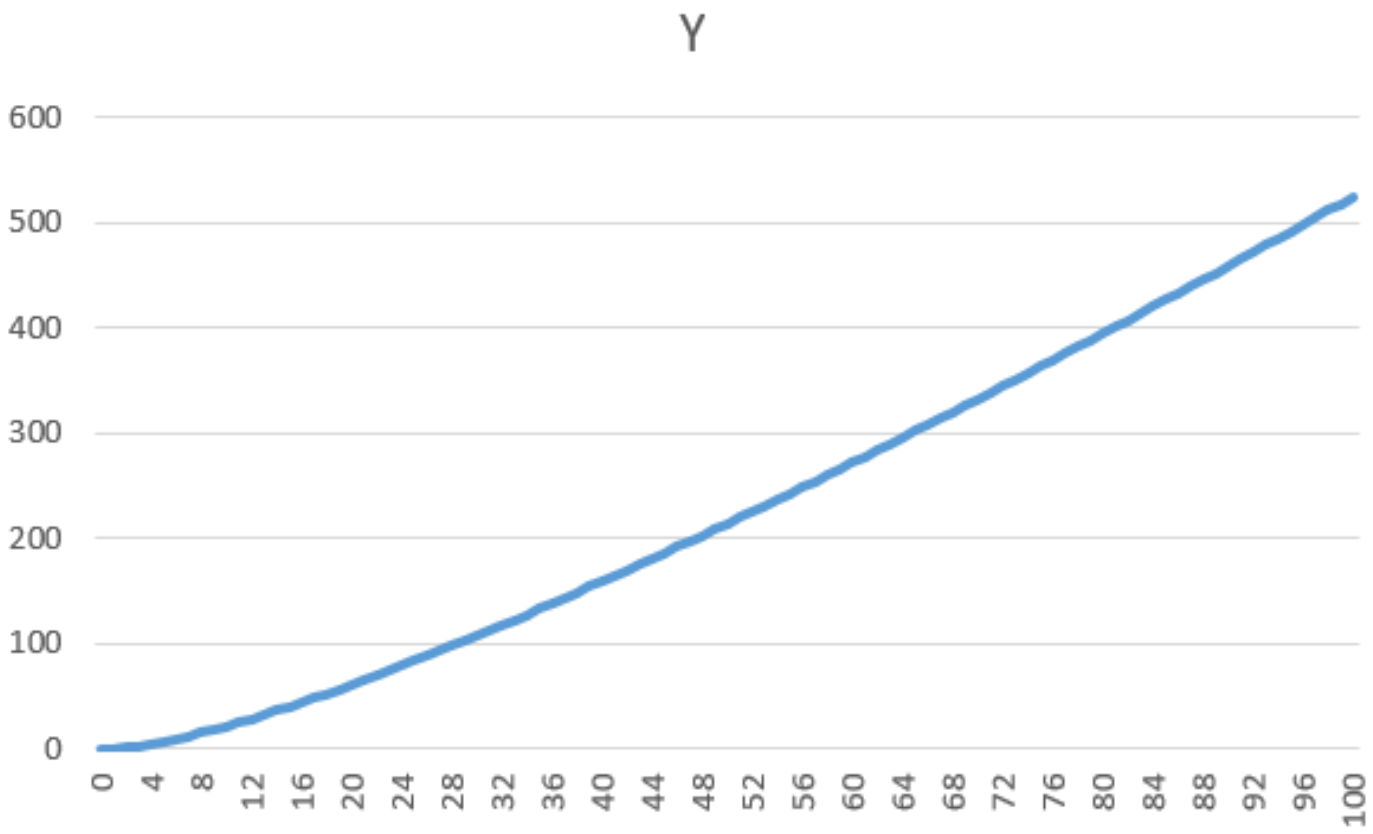


Observations-

I. This function is not defined for the input values 0 and 1 as can be seen in the excel screenshot at the end. For these inputs, the output is treated as default by the excel and hence the above graph starts as a flat line.
II. The graph then steeps down to the only negative value output in the range from 0 to 100.
III. Further, the graph quickly rises up, then gradually slows down, thereby depicting the behaviour of a logarithmic function.
IV. From the execution of the graph, it is found that it limits to the approximate value of 2.63 at large inputs that are in the range of a million.

```
1000170 2.63
1000171 2.63
1000172 2.63
1000173 2.63
1000174 2.63
1000175 2.63
1000176 2.63
1000177 2.63
1000178 2.63
1000179 2.63
1000180 2.63
1000181 2.63
1000182 2.63
1000183 2.63
1000184 2.63
1000185 2.63
1000186 2.63
1000187 2.63
1000188 2.63
```

[D] Function-4: $\log_2(n!)$



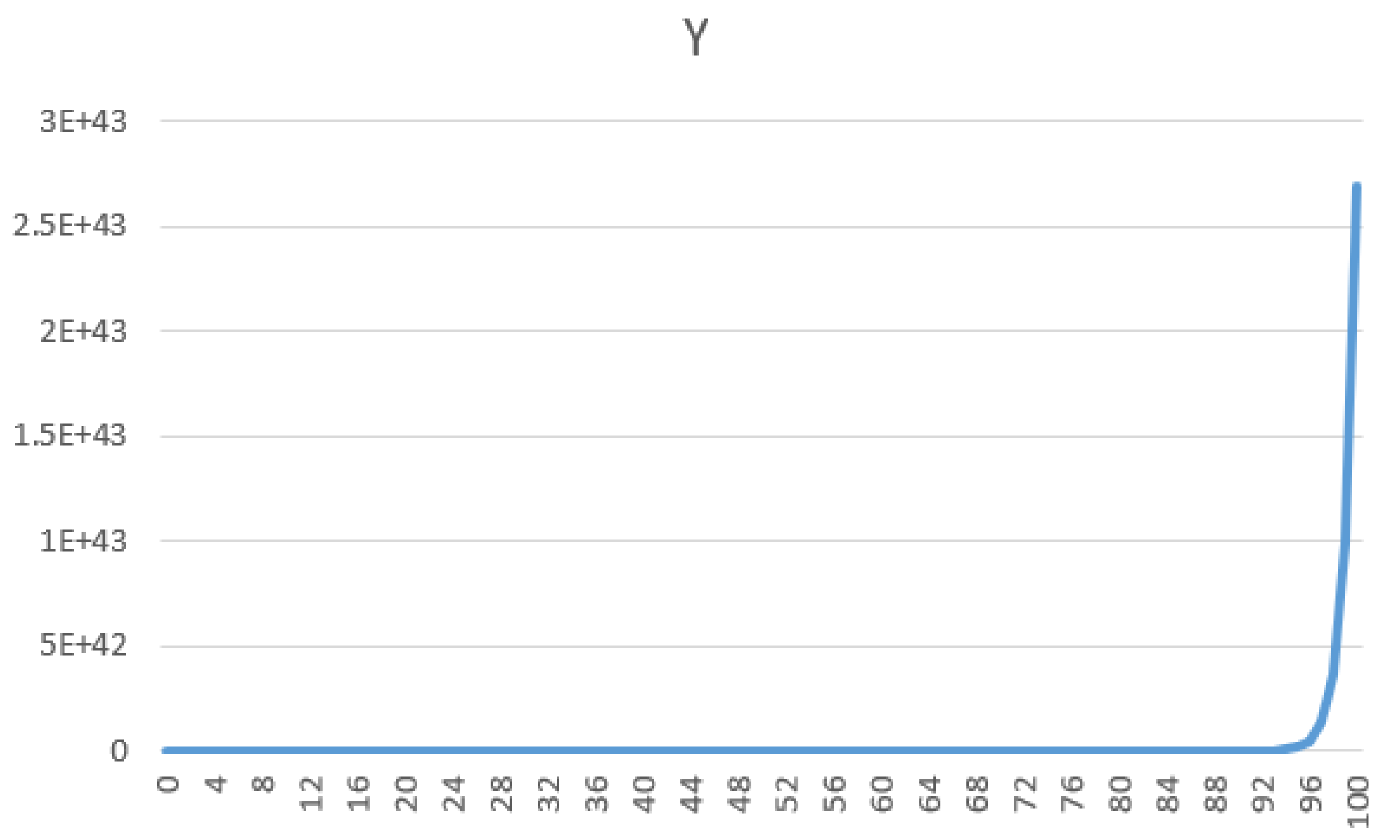
Observations-

I. An almost linear behaviour of the function is observed through its graph plotted for the inputs from 0 to 100.

II. Due to the primary part of the function being factorial, we observe that vague values are obtained once the input crosses the value of 170. This is shown in the image below.

166	989.78
167	997.17
168	1004.56
169	1011.96
170	1019.37
171	1.#J
172	1.#J
173	1.#J
174	1.#J
175	1.#J
176	1.#J
177	1.#J
178	1.#J
179	1.#J
180	1.#J
181	1.#J
182	1.#J
183	1.#J
184	1.#J
185	1.#J
186	1.#J
187	1.#J
188	1.#J

[E] Function-5: e^n

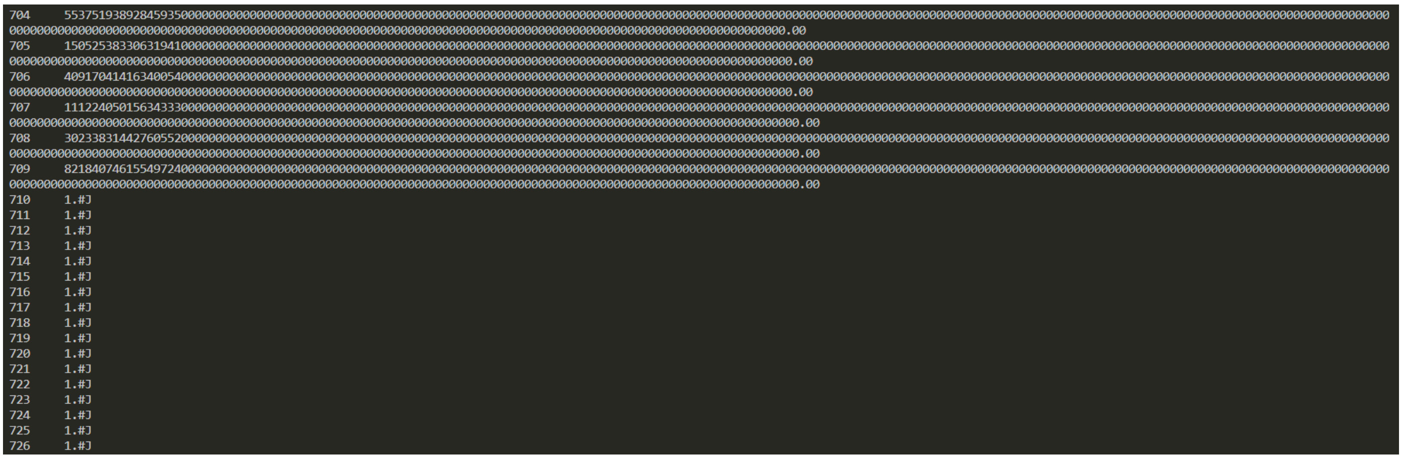


<u>Observations</u>-

I. In the plot of the graph for input ranging from 0 to 100, a flat line is observed which suddenly rises around the input value of 96, showing a very steep behaviour.

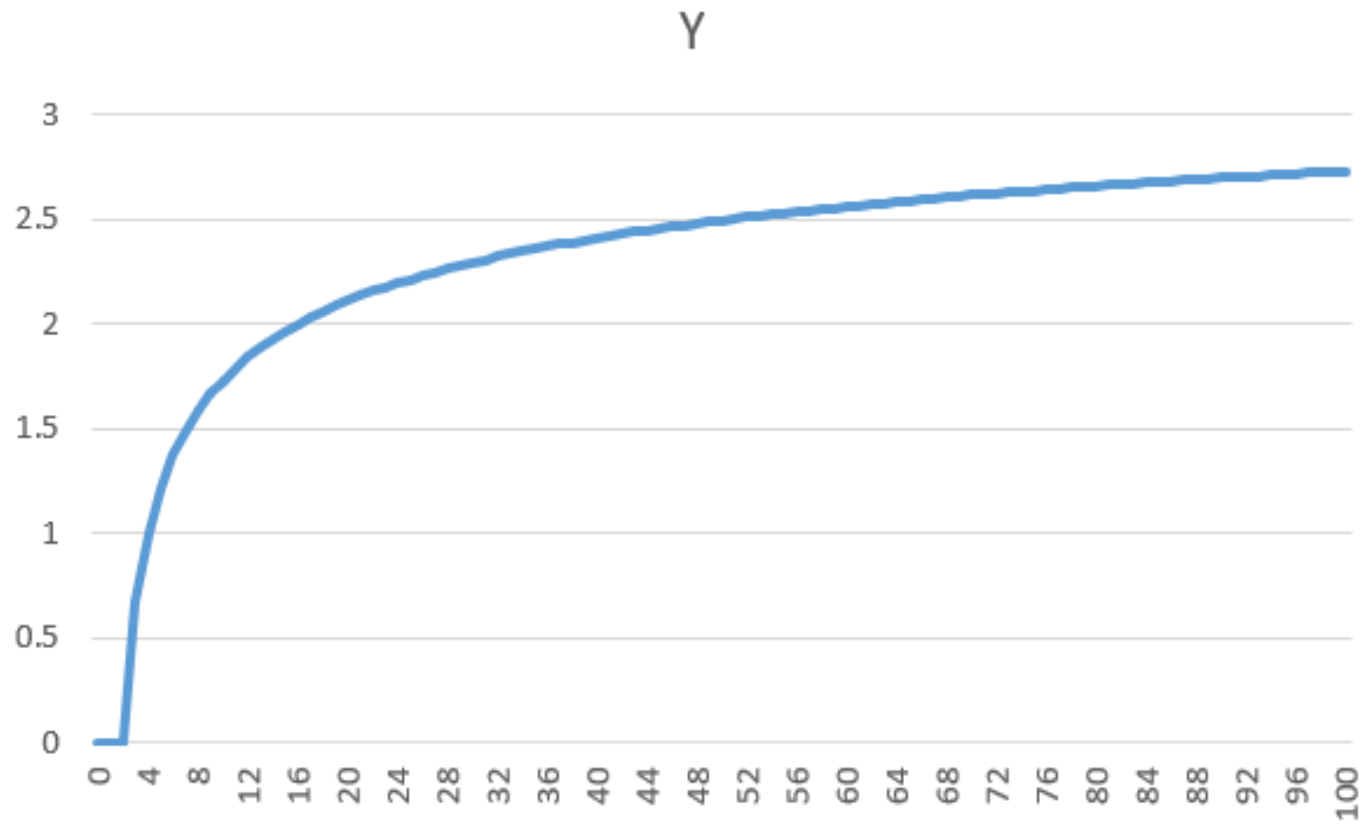
II. The sudden shift of output demonstrates the nature of an exponential function.

III. Upon executing the function for inputs beyond the value of 100, it is found that we start getting vague outputs after the value of 709. This is shown below.



```
704     5537519389284593500000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
705     1505253833063194100000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
706     4091704141634005400000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
707     1112240501563433300000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
708     3023383144276055200000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
709     8218407461554972400000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
710     1.#J
711     1.#J
712     1.#J
713     1.#J
714     1.#J
715     1.#J
716     1.#J
717     1.#J
718     1.#J
719     1.#J
720     1.#J
721     1.#J
722     1.#J
723     1.#J
724     1.#J
725     1.#J
726     1.#J
```

[F] Function-6: $\log_2(\log_2 n)$

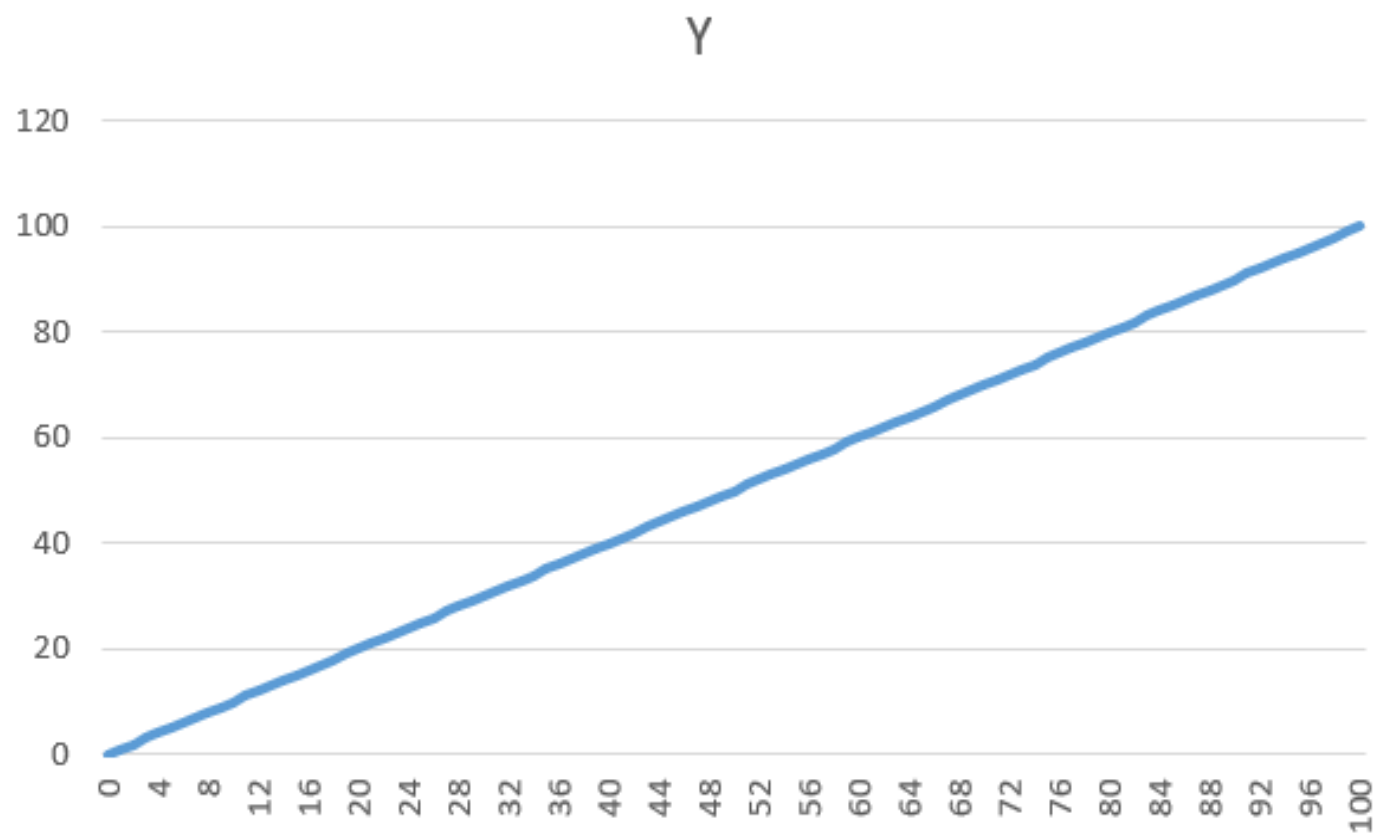


Observations-

I. This particular function is undefined for the input values 0 and 1, the output of which are shown as zero in the graph(the default output for excel).
II. Further, the graph increases, first rapidly, then slowly, concaving in the downward direction.
III. At the input values that fall in the range of a million, we find that the output limits to a value of 4.32. This is illustrated below.

```
1000931 4.32
1000932 4.32
1000933 4.32
1000934 4.32
1000935 4.32
1000936 4.32
1000937 4.32
1000938 4.32
1000939 4.32
1000940 4.32
1000941 4.32
1000942 4.32
1000943 4.32
1000944 4.32
1000945 4.32
1000946 4.32
1000947 4.32
1000948 4.32
1000949 4.32
1000950 4.32
1000951 4.32
1000952 4.32
```

[G] Function-7: n

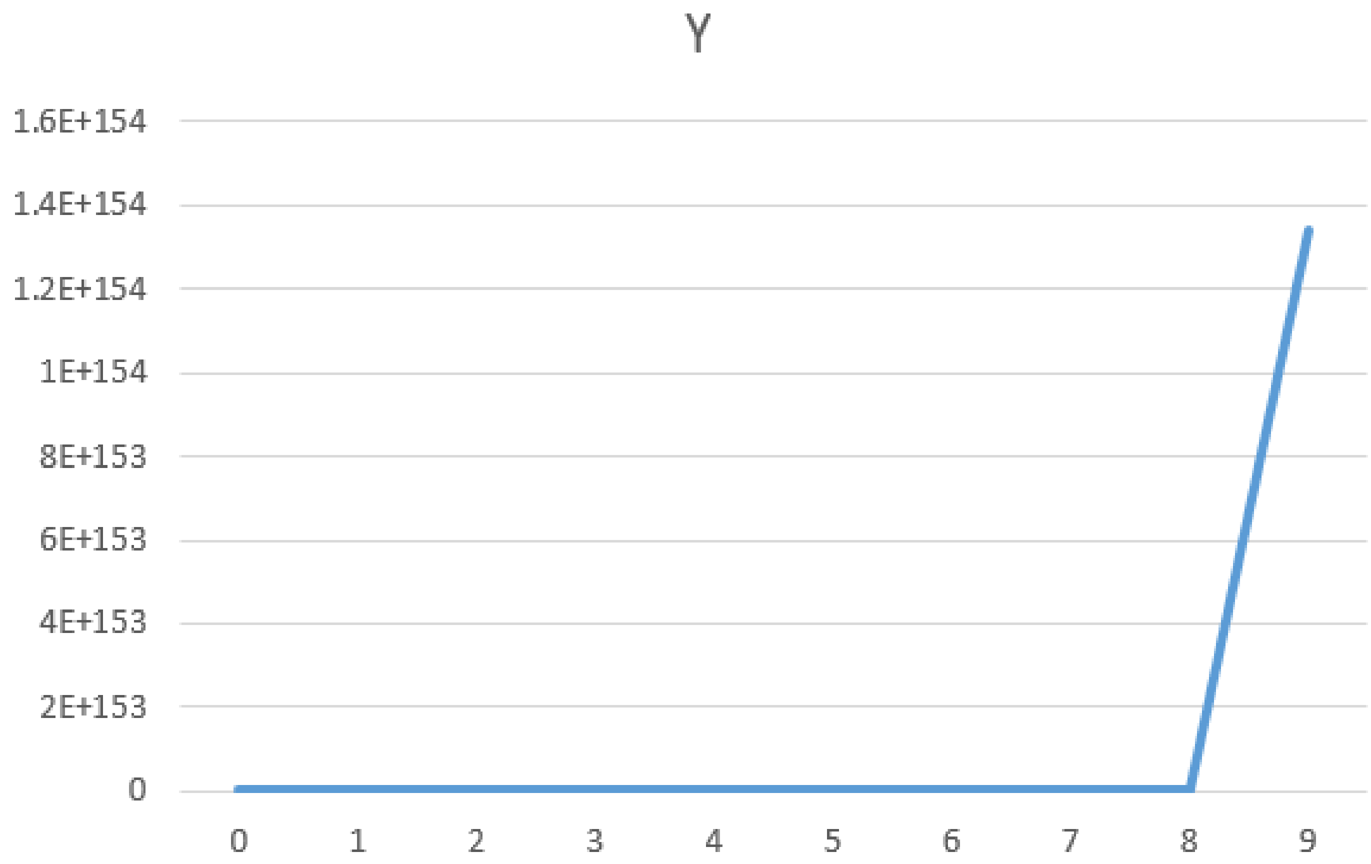


Observations-

I. A straight line is obtained as we are dealing with a linear function in this case.
II. Upon the execution of this function for input values that are much larger than 100, the outputs are quickly obtained as the function is linear.
III. There are no input values for which the output is undefined. Given below is a sample output of the execution of this function.

```
1542939 1542939.00
1542940 1542940.00
1542941 1542941.00
1542942 1542942.00
1542943 1542943.00
1542944 1542944.00
1542945 1542945.00
1542946 1542946.00
1542947 1542947.00
1542948 1542948.00
1542949 1542949.00
1542950 1542950.00
1542951 1542951.00
1542952 1542952.00
1542953 1542953.00
1542954 1542954.00
1542955 1542955.00
1542956 1542956.00
```

[H] Function-8: 2^{2^n}

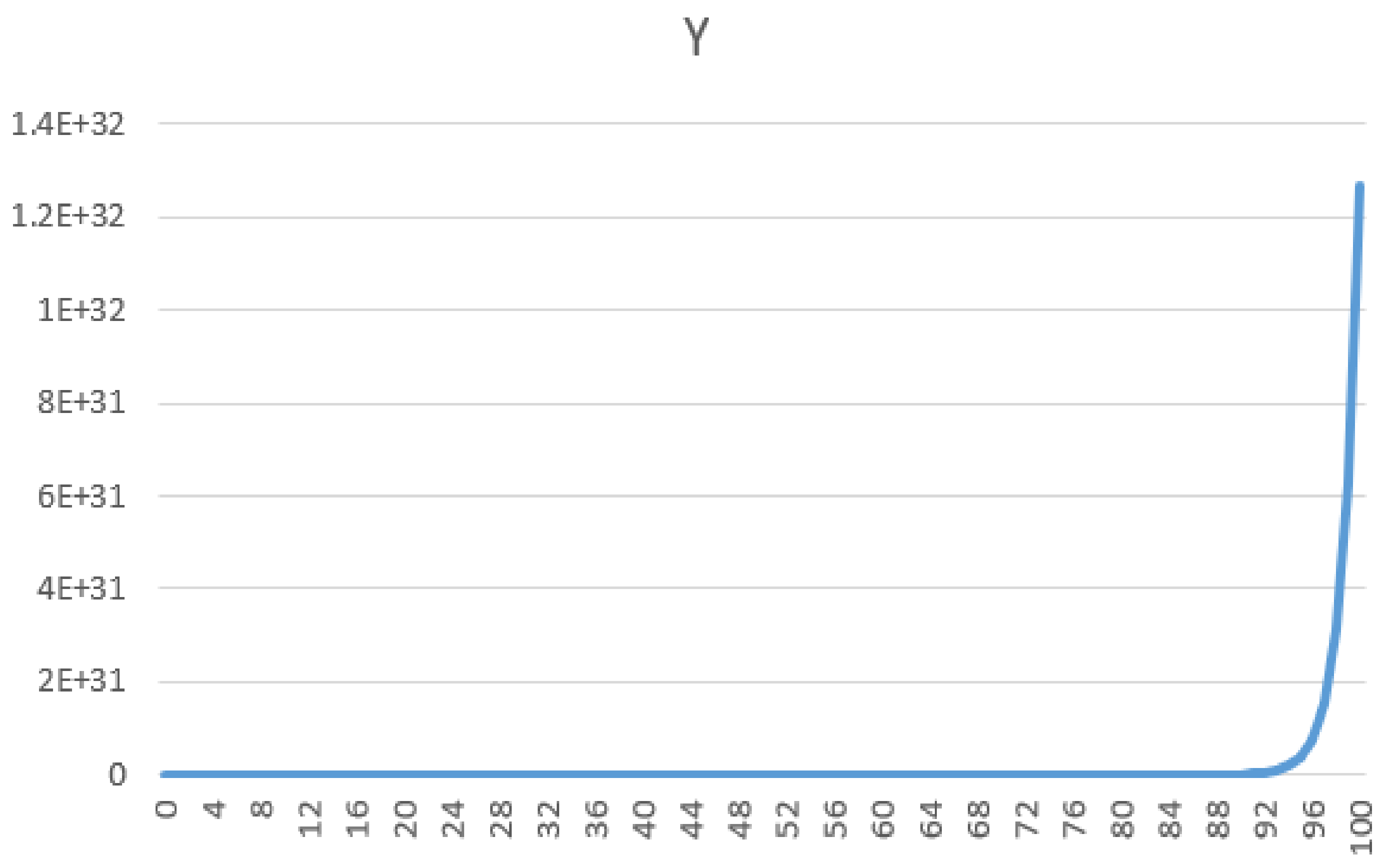


<u>Observations</u>-

I. The above graph demonstrates that this function increases very rapidly even when the increment in the input is very less.
II. From the execution of this function on the terminal, it was noticed that for input values greater than 9, vague outputs were obtained. This is shown in the following image.
III. From the graph, we also see a sharp increase of the output when the input changes from 8 to 9.

```
0       2.00
1       4.00
2       16.00
3       256.00
4       65536.00
5       4294967296.00
6       18446744073709552000.00
7       340282366920938460000000000000000000000.00
8       115792089237316200000000000000000000000000000000000000000000000000000000000000.00
9       13407807929942597000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
10      1.#J
11      1.#J
12      1.#J
13      1.#J
14      1.#J
15      1.#J
16      1.#J
17      1.#J
18      1.#J
19      1.#J
20      1.#J
```

[I] Function-9: $n.2^n$



<u>Observations</u>-

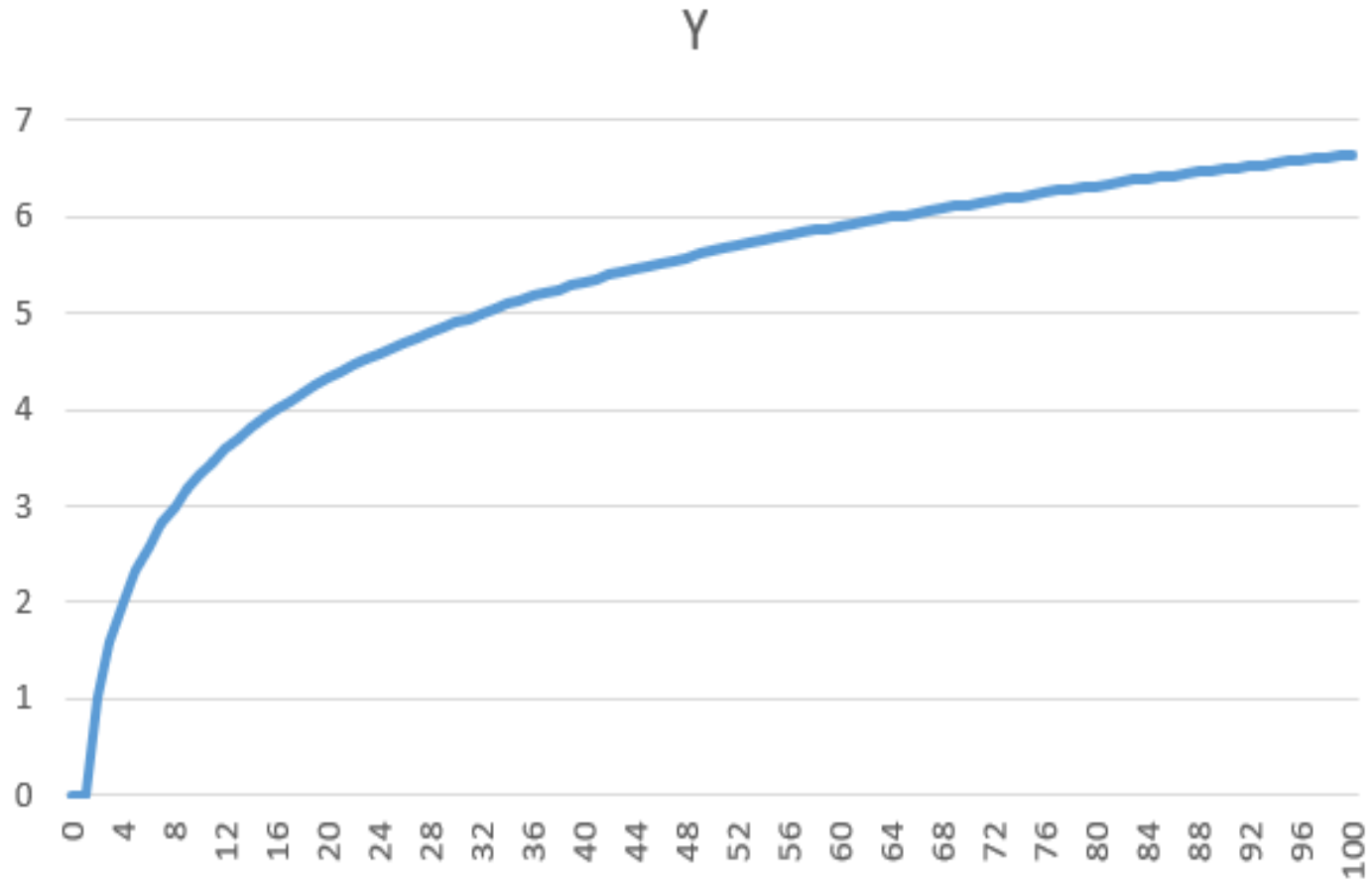
I. The above graph is noted to be similar to that of a generic exponential function, except for the fact that an extra factor of n is included as well.

II. This graph also shows a steep rise near the input value of 96. The output moves in the order of 32^{nd} power of 10 while the input is just 100.

III. Upon the execution of this function, we get to know that vague values are obtained for input values that are greater than 1014. This is shown below.

```
1008    27650065306720191000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1009    55354991854128319000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1010    11081970618963251000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1011    22185885734201677000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1012    44415660460953704000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1013    88919098907008106000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1014    17801375378421761000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000.00
1015    1.#J
1016    1.#J
1017    1.#J
1018    1.#J
1019    1.#J
1020    1.#J
1021    1.#J
1022    1.#J
1023    1.#J
1024    1.#J
1025    1.#J
```

[J] Function-10: $\log_2 n$

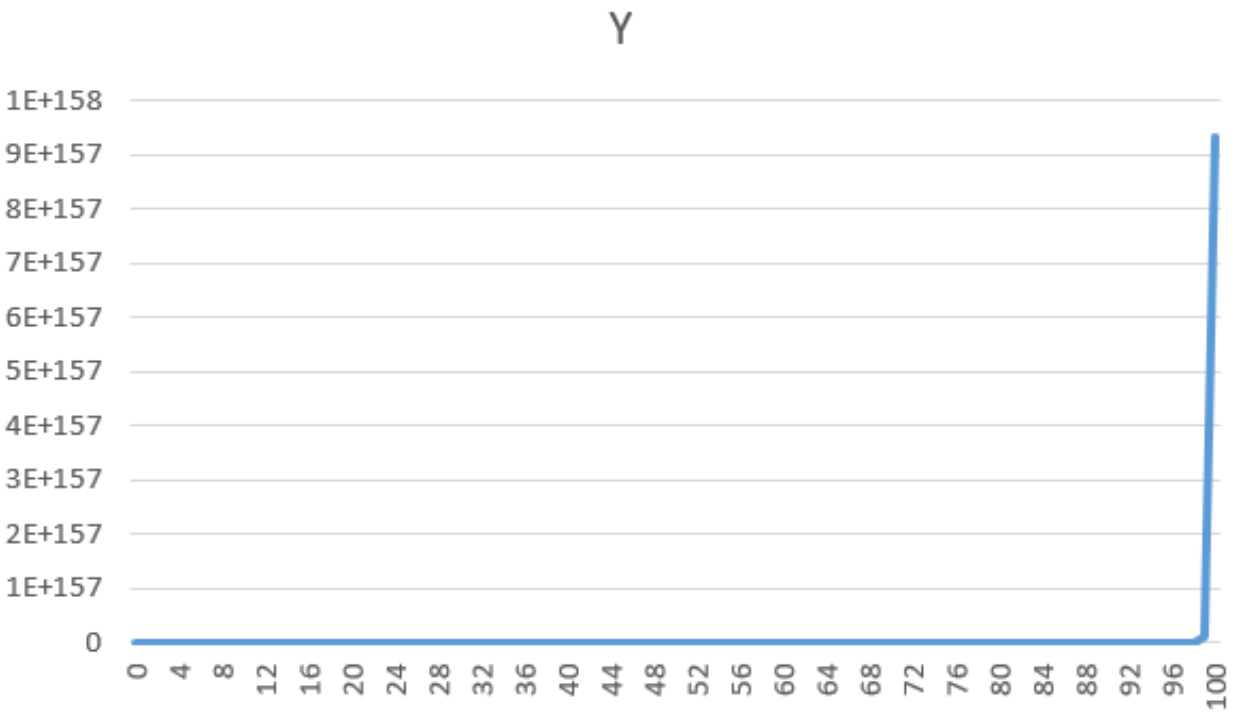


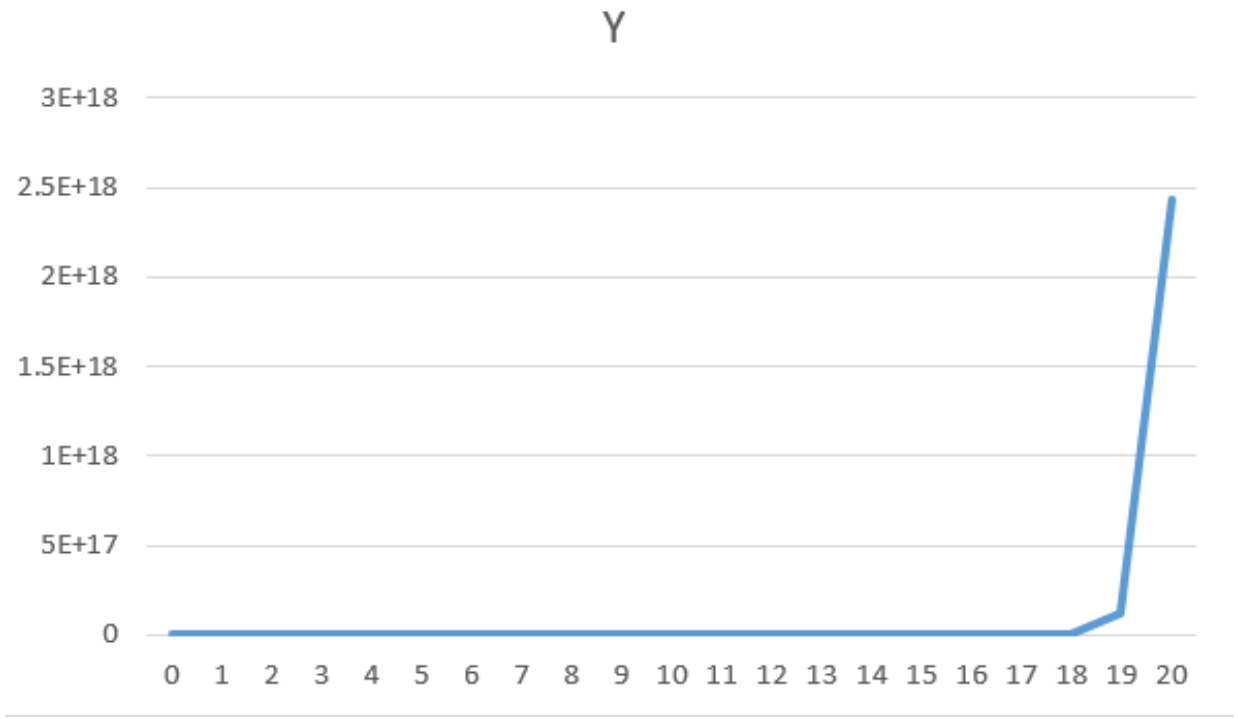
Observations-

I. The graph of this function roughly imitates the one belonging to a generic logarithmic function having a base value greater than 1.
II. This function is undefined at the input value of 0, the output at which is shown as 0 in the graph as per the default behaviour of the graph in an excel file.
III. This function, being a logarithmic one, succeeds in providing proper outputs even when the inputs are in millions or billions.

```
1000045037      29.90
1000045038      29.90
1000045039      29.90
1000045040      29.90
1000045041      29.90
1000045042      29.90
1000045043      29.90
1000045044      29.90
1000045045      29.90
1000045046      29.90
1000045047      29.90
1000045048      29.90
1000045049      29.90
1000045050      29.90
1000045051      29.90
1000045052      29.90
1000045053      29.90
1000045054      29.90
1000045055      29.90
```

[K] Function-11: n!





Observations-

I. From both the above graphs that are plotted for the ranges 0 to 100 and 0 to 20 respectively, we find that even the factorial function has a rapid increase in its output when the input increases by a small value.

II. As observed in function-4, upon trying to calculate the factorials of inputs greater than 100, we find that after the value of 170, vague values are found in the output.

Given below is a glimpse of the excel file where all the x-y values for all the various functions were pasted.

Function-1	
X	Y
0	1
1	1.5
2	2.25
3	3.38
4	5.06
5	7.59
6	11.39
7	17.09
8	25.63
9	38.44
10	57.67
11	86.5
12	129.75
13	194.62
14	291.93
15	437.89
16	656.84
17	985.26
18	1477.89
19	2216.84
20	3325.26
21	4987.89
22	7481.83
23	11222.74
24	16834.11
25	25251.17
26	37876.75
27	56815.13
28	85222.69
29	127834
30	191751.1
31	287626.6
32	431439.9
33	647159.8
34	970739.7
35	1456110
36	2184164
37	3276247
38	4914370
39	7371555
40	11057332
41	16585998
42	24878998
43	37318497
44	55977745
45	83966617
46	1.26E+08
47	1.89E+08
48	2.83E+08
49	4.25E+08
50	6.38E+08
51	9.56E+08
52	1.43E+09
53	2.15E+09

Function-2	
X	Y
0	0
1	1
2	8
3	27
4	64
5	125
6	216
7	343
8	512
9	729
10	1000
11	1331
12	1728
13	2197
14	2744
15	3375
16	4096
17	4913
18	5832
19	6859
20	8000
21	9261
22	10648
23	12167
24	13824
25	15625
26	17576
27	19683
28	21952
29	24389
30	27000
31	29791
32	32768
33	35937
34	39304
35	42875
36	46656
37	50653
38	54872
39	59319
40	64000
41	68921
42	74088
43	79507
44	85184
45	91125
46	97336
47	103823
48	110592
49	117649
50	125000
51	132651
52	140608
53	148877

Function-3	
X	Y
0	1.#QNB
1	-1.#INF
2	-0.3665
3	0.094
4	0.3266
5	0.4759
6	0.5832
7	0.6657
8	0.7321
9	0.7872
10	0.834
11	0.8746
12	0.9102
13	0.9419
14	0.9704
15	0.9962
16	1.0198
17	1.0414
18	1.0614
19	1.0799
20	1.0972
21	1.1133
22	1.1285
23	1.1428
24	1.1563
25	1.169
26	1.1811
27	1.1927
28	1.2036
29	1.2141
30	1.2241
31	1.2337
32	1.2429
33	1.2518
34	1.2603
35	1.2685
36	1.2763
37	1.284
38	1.2913
39	1.2984
40	1.3053
41	1.312
42	1.3185
43	1.3247
44	1.3308
45	1.3368
46	1.3425
47	1.3481
48	1.3536
49	1.3589
50	1.3641
51	1.3691
52	1.374
53	1.3788

Function-4	
X	Y
0	0
1	0
2	1
3	2.58
4	4.58
5	6.91
6	9.49
7	12.3
8	15.3
9	18.47
10	21.79
11	25.25
12	28.84
13	32.54
14	36.34
15	40.25
16	44.25
17	48.34
18	52.51
19	56.76
20	61.08
21	65.47
22	69.93
23	74.45
24	79.04
25	83.68
26	88.38
27	93.14
28	97.94
29	102.8
30	107.71
31	112.66
32	117.66
33	122.71
34	127.8
35	132.92
36	138.09
37	143.3
38	148.55
39	153.84
40	159.16
41	164.52
42	169.91
43	175.34
44	180.79
45	186.29
46	191.81
47	197.36
48	202.95
49	208.56
50	214.21
51	219.88
52	225.58
53	231.31

54	3.23E+09	54	157464	54	1.3835	54	237.06
55	4.84E+09	55	166375	55	1.3881	55	242.85
56	7.26E+09	56	175616	56	1.3926	56	248.65
57	1.09E+10	57	185193	57	1.397	57	254.49
58	1.63E+10	58	195112	58	1.4013	58	260.34
59	2.45E+10	59	205379	59	1.4055	59	266.23
60	3.68E+10	60	216000	60	1.4096	60	272.13
61	5.52E+10	61	226981	61	1.4136	61	278.06
62	8.27E+10	62	238328	62	1.4176	62	284.02
63	1.24E+11	63	250047	63	1.4215	63	290
64	1.86E+11	64	262144	64	1.4252	64	296
65	2.79E+11	65	274625	65	1.429	65	302.02
66	4.19E+11	66	287496	66	1.4326	66	308.06
67	6.28E+11	67	300763	67	1.4362	67	314.13
68	9.42E+11	68	314432	68	1.4397	68	320.22
69	1.41E+12	69	328509	69	1.4432	69	326.32
70	2.12E+12	70	343000	70	1.4466	70	332.45
71	3.18E+12	71	357911	71	1.4499	71	338.6
72	4.77E+12	72	373248	72	1.4532	72	344.77
73	7.16E+12	73	389017	73	1.4564	73	350.96
74	1.07E+13	74	405224	74	1.4596	74	357.17
75	1.61E+13	75	421875	75	1.4627	75	363.4
76	2.42E+13	76	438976	76	1.4657	76	369.65
77	3.62E+13	77	456533	77	1.4688	77	375.92
78	5.43E+13	78	474552	78	1.4717	78	382.2
79	8.15E+13	79	493039	79	1.4746	79	388.5
80	1.22E+14	80	512000	80	1.4775	80	394.83
81	1.83E+14	81	531441	81	1.4803	81	401.17
82	2.75E+14	82	551368	82	1.4831	82	407.52
83	4.13E+14	83	571787	83	1.4859	83	413.9
84	6.19E+14	84	592704	84	1.4886	84	420.29
85	9.28E+14	85	614125	85	1.4913	85	426.7
86	1.39E+15	86	636056	86	1.4939	86	433.13
87	2.09E+15	87	658503	87	1.4965	87	439.57
88	3.13E+15	88	681472	88	1.499	88	446.03
89	4.7E+15	89	704969	89	1.5015	89	452.51
90	7.05E+15	90	729000	90	1.504	90	459
91	1.06E+16	91	753571	91	1.5065	91	465.51
92	1.59E+16	92	778688	92	1.5089	92	472.03
93	2.38E+16	93	804357	93	1.5113	93	478.57
94	3.57E+16	94	830584	94	1.5137	94	485.12
95	5.35E+16	95	857375	95	1.516	95	491.69
96	8.03E+16	96	884736	96	1.5183	96	498.28
97	1.2E+17	97	912673	97	1.5205	97	504.88
98	1.81E+17	98	941192	98	1.5228	98	511.49
99	2.71E+17	99	970299	99	1.525	99	518.12
100	4.07E+17	100	1000000	100	1.5272	100	524.76

Function-5	
X	Y
0	1
1	2.72
2	7.39
3	20.09
4	54.6
5	148.41
6	403.43
7	1096.63
8	2980.96
9	8103.08
10	22026.47
11	59874.14
12	162754.8
13	442413.4
14	1202604
15	3269017
16	8886111
17	24154953
18	65659969
19	1.78E+08
20	4.85E+08
21	1.32E+09
22	3.58E+09
23	9.74E+09
24	2.65E+10
25	7.2E+10
26	1.96E+11
27	5.32E+11
28	1.45E+12
29	3.93E+12
30	1.07E+13
31	2.9E+13
32	7.9E+13
33	2.15E+14
34	5.83E+14
35	1.59E+15
36	4.31E+15
37	1.17E+16
38	3.19E+16
39	8.66E+16
40	2.35E+17
41	6.4E+17
42	1.74E+18
43	4.73E+18
44	1.29E+19
45	3.49E+19
46	9.5E+19
47	2.58E+20
48	7.02E+20
49	1.91E+21
50	5.18E+21
51	1.41E+22
52	3.83E+22
53	1.04E+23

Function-6	
X	Y
0	1.#QNB
1	-1.#INF
2	0
3	0.6644
4	1
5	1.2153
6	1.3701
7	1.4892
8	1.585
9	1.6644
10	1.732
11	1.7905
12	1.842
13	1.8877
14	1.9288
15	1.966
16	2
17	2.0312
18	2.06
19	2.0868
20	2.1117
21	2.135
22	2.1569
23	2.1775
24	2.1969
25	2.2153
26	2.2328
27	2.2494
28	2.2652
29	2.2804
30	2.2948
31	2.3087
32	2.3219
33	2.3347
34	2.3469
35	2.3588
36	2.3701
37	2.3811
38	2.3917
39	2.402
40	2.4119
41	2.4216
42	2.4309
43	2.44
44	2.4488
45	2.4573
46	2.4656
47	2.4737
48	2.4815
49	2.4892
50	2.4967
51	2.504
52	2.5111
53	2.518

Function-7	
X	Y
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34
35	35
36	36
37	37
38	38
39	39
40	40
41	41
42	42
43	43
44	44
45	45
46	46
47	47
48	48
49	49
50	50
51	51
52	52
53	53

Function-8	
X	Y
0	2
1	4
2	16
3	256
4	65536
5	4.29E+09
6	1.84E+19
7	3.4E+38
8	1.16E+77
9	1.3E+154
10	1.#J
11	1.#J
12	1.#J
13	1.#J
14	1.#J
15	1.#J
16	1.#J
17	1.#J
18	1.#J
19	1.#J
20	1.#J
21	1.#J
22	1.#J
23	1.#J
24	1.#J
25	1.#J
26	1.#J
27	1.#J
28	1.#J
29	1.#J
30	1.#J
31	1.#J
32	1.#J
33	1.#J
34	1.#J
35	1.#J
36	1.#J
37	1.#J
38	1.#J
39	1.#J
40	1.#J
41	1.#J
42	1.#J
43	1.#J
44	1.#J
45	1.#J
46	1.#J
47	1.#J
48	1.#J
49	1.#J
50	1.#J
51	1.#J
52	1.#J
53	1.#J

54	2.83E+23		54	2.5248		54	54		54	1.#J
55	7.69E+23		55	2.5314		55	55		55	1.#J
56	2.09E+24		56	2.5379		56	56		56	1.#J
57	5.69E+24		57	2.5442		57	57		57	1.#J
58	1.55E+25		58	2.5504		58	58		58	1.#J
59	4.2E+25		59	2.5565		59	59		59	1.#J
60	1.14E+26		60	2.5624		60	60		60	1.#J
61	3.1E+26		61	2.5682		61	61		61	1.#J
62	8.44E+26		62	2.5739		62	62		62	1.#J
63	2.29E+27		63	2.5795		63	63		63	1.#J
64	6.24E+27		64	2.585		64	64		64	1.#J
65	1.69E+28		65	2.5903		65	65		65	1.#J
66	4.61E+28		66	2.5956		66	66		66	1.#J
67	1.25E+29		67	2.6008		67	67		67	1.#J
68	3.4E+29		68	2.6058		68	68		68	1.#J
69	9.25E+29		69	2.6108		69	69		69	1.#J
70	2.52E+30		70	2.6157		70	70		70	1.#J
71	6.84E+30		71	2.6205		71	71		71	1.#J
72	1.86E+31		72	2.6253		72	72		72	1.#J
73	5.05E+31		73	2.6299		73	73		73	1.#J
74	1.37E+32		74	2.6345		74	74		74	1.#J
75	3.73E+32		75	2.639		75	75		75	1.#J
76	1.01E+33		76	2.6434		76	76		76	1.#J
77	2.76E+33		77	2.6477		77	77		77	1.#J
78	7.5E+33		78	2.652		78	78		78	1.#J
79	2.04E+34		79	2.6562		79	79		79	1.#J
80	5.54E+34		80	2.6604		80	80		80	1.#J
81	1.51E+35		81	2.6644		81	81		81	1.#J
82	4.09E+35		82	2.6685		82	82		82	1.#J
83	1.11E+36		83	2.6724		83	83		83	1.#J
84	3.03E+36		84	2.6763		84	84		84	1.#J
85	8.22E+36		85	2.6802		85	85		85	1.#J
86	2.24E+37		86	2.684		86	86		86	1.#J
87	6.08E+37		87	2.6877		87	87		87	1.#J
88	1.65E+38		88	2.6914		88	88		88	1.#J
89	4.49E+38		89	2.695		89	89		89	1.#J
90	1.22E+39		90	2.6986		90	90		90	1.#J
91	3.32E+39		91	2.7022		91	91		91	1.#J
92	9.02E+39		92	2.7057		92	92		92	1.#J
93	2.45E+40		93	2.7091		93	93		93	1.#J
94	6.66E+40		94	2.7125		94	94		94	1.#J
95	1.81E+41		95	2.7159		95	95		95	1.#J
96	4.92E+41		96	2.7192		96	96		96	1.#J
97	1.34E+42		97	2.7224		97	97		97	1.#J
98	3.64E+42		98	2.7257		98	98		98	1.#J
99	9.89E+42		99	2.7289		99	99		99	1.#J
100	2.69E+43		100	2.732		100	100		100	1.#J

Function-9	
X	Y
0	0
1	2
2	8
3	24
4	64
5	160
6	384
7	896
8	2048
9	4608
10	10240
11	22528
12	49152
13	106496
14	229376
15	491520
16	1048576
17	2228224
18	4718592
19	9961472
20	20971520
21	44040192
22	92274688
23	1.93E+08
24	4.03E+08
25	8.39E+08
26	1.74E+09
27	3.62E+09
28	7.52E+09
29	1.56E+10
30	3.22E+10
31	6.66E+10
32	1.37E+11
33	2.83E+11
34	5.84E+11
35	1.2E+12
36	2.47E+12
37	5.09E+12
38	1.04E+13
39	2.14E+13
40	4.4E+13
41	9.02E+13
42	1.85E+14
43	3.78E+14
44	7.74E+14
45	1.58E+15
46	3.24E+15
47	6.61E+15
48	1.35E+16
49	2.76E+16
50	5.63E+16
51	1.15E+17
52	2.34E+17
53	4.77E+17

Function-10	
X	Y
0	-1.#J
1	0
2	1
3	1.58
4	2
5	2.32
6	2.58
7	2.81
8	3
9	3.17
10	3.32
11	3.46
12	3.58
13	3.7
14	3.81
15	3.91
16	4
17	4.09
18	4.17
19	4.25
20	4.32
21	4.39
22	4.46
23	4.52
24	4.58
25	4.64
26	4.7
27	4.75
28	4.81
29	4.86
30	4.91
31	4.95
32	5
33	5.04
34	5.09
35	5.13
36	5.17
37	5.21
38	5.25
39	5.29
40	5.32
41	5.36
42	5.39
43	5.43
44	5.46
45	5.49
46	5.52
47	5.55
48	5.58
49	5.61
50	5.64
51	5.67
52	5.7
53	5.73

Function-11	
X	Y
0	1
1	1
2	2
3	6
4	24
5	120
6	720
7	5040
8	40320
9	362880
10	3628800
11	39916800
12	4.79E+08
13	6.23E+09
14	8.72E+10
15	1.31E+12
16	2.09E+13
17	3.56E+14
18	6.4E+15
19	1.22E+17
20	2.43E+18
21	5.11E+19
22	1.12E+21
23	2.59E+22
24	6.2E+23
25	1.55E+25
26	4.03E+26
27	1.09E+28
28	3.05E+29
29	8.84E+30
30	2.65E+32
31	8.22E+33
32	2.63E+35
33	8.68E+36
34	2.95E+38
35	1.03E+40
36	3.72E+41
37	1.38E+43
38	5.23E+44
39	2.04E+46
40	8.16E+47
41	3.35E+49
42	1.41E+51
43	6.04E+52
44	2.66E+54
45	1.2E+56
46	5.5E+57
47	2.59E+59
48	1.24E+61
49	6.08E+62
50	3.04E+64
51	1.55E+66
52	8.07E+67
53	4.27E+69

54	9.73E+17	54	5.75	54	2.31E+71
55	1.98E+18	55	5.78	55	1.27E+73
56	4.04E+18	56	5.81	56	7.11E+74
57	8.21E+18	57	5.83	57	4.05E+76
58	1.67E+19	58	5.86	58	2.35E+78
59	3.4E+19	59	5.88	59	1.39E+80
60	6.92E+19	60	5.91	60	8.32E+81
61	1.41E+20	61	5.93	61	5.08E+83
62	2.86E+20	62	5.95	62	3.15E+85
63	5.81E+20	63	5.98	63	1.98E+87
64	1.18E+21	64	6	64	1.27E+89
65	2.4E+21	65	6.02	65	8.25E+90
66	4.87E+21	66	6.04	66	5.44E+92
67	9.89E+21	67	6.07	67	3.65E+94
68	2.01E+22	68	6.09	68	2.48E+96
69	4.07E+22	69	6.11	69	1.71E+98
70	8.26E+22	70	6.13	70	1.2E+100
71	1.68E+23	71	6.15	71	8.5E+101
72	3.4E+23	72	6.17	72	6.1E+103
73	6.89E+23	73	6.19	73	4.5E+105
74	1.4E+24	74	6.21	74	3.3E+107
75	2.83E+24	75	6.23	75	2.5E+109
76	5.74E+24	76	6.25	76	1.9E+111
77	1.16E+25	77	6.27	77	1.5E+113
78	2.36E+25	78	6.29	78	1.1E+115
79	4.78E+25	79	6.3	79	8.9E+116
80	9.67E+25	80	6.32	80	7.2E+118
81	1.96E+26	81	6.34	81	5.8E+120
82	3.97E+26	82	6.36	82	4.8E+122
83	8.03E+26	83	6.38	83	3.9E+124
84	1.62E+27	84	6.39	84	3.3E+126
85	3.29E+27	85	6.41	85	2.8E+128
86	6.65E+27	86	6.43	86	2.4E+130
87	1.35E+28	87	6.44	87	2.1E+132
88	2.72E+28	88	6.46	88	1.9E+134
89	5.51E+28	89	6.48	89	1.7E+136
90	1.11E+29	90	6.49	90	1.5E+138
91	2.25E+29	91	6.51	91	1.4E+140
92	4.56E+29	92	6.52	92	1.2E+142
93	9.21E+29	93	6.54	93	1.2E+144
94	1.86E+30	94	6.55	94	1.1E+146
95	3.76E+30	95	6.57	95	1E+148
96	7.61E+30	96	6.58	96	9.9E+149
97	1.54E+31	97	6.6	97	9.6E+151
98	3.11E+31	98	6.61	98	9.4E+153
99	6.27E+31	99	6.63	99	9.3E+155
100	1.27E+32	100	6.64	100	9.3E+157

Conclusion:

By performing this experiment, I was able to observe the difference in the various functions that were implemented. I was also able to understand the procedure of plotting a graph from the obtained data using Microsoft excel.