DESIGN AND ANALYSIS OF ALGORITHMS

EXPERIMENT 1

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Aim: – To implement the various functions example linear, non-linear, quadratic, exponential etc.

Algorithm:

1.Start

2.Make eleven columns one which includes n value and the remaining ten for the functions.

3.Run a for loop starting from i=0 to 100 to print the value of all the functions. In this loop

a) Define function F1 as (3/2)^n and print its value.
b) Define function F2 as (n)^3 and print its value.
c) Define function F3 as (n) and print its value
d) Define function F4 as (2)^n and print its value
e) Define function F5 as ln(n) and print its value
f) Define function F6 as log(n) and print its value
g) Define function F7 as log(log(n)) and print its value
h) Define function F8 as (n)*(2^n) and print its value
i) Define function F9 as (e)^n and print its value
j) Define function F10 as 2^(log(n)) and print its value

4.To print the factorial of first 20 numbers initialise fact=1 and fact=fact*I and print its value.

5.Stop

Program:

```
#include <stdio.h>
#include<math.h>
double f1(int i)
{
   return pow(3.0/2,i);
}
```

```
double f2(int i)
{
   return pow(i,3);
}

int f3(int i)
{
   return i;
}

float f4(int i)
{
   return pow(2,i);
}

double f5(int i)
{
   return log(i);
}

double f6(int i)
{
   return log(i)/log(10);
}

double f7(int i)
{
   return log(log(i));
}

double f8(int i)
{
   return i*pow(2,i);
}

double f9(int i)
{
   return pow(2.71,i);
}

double f10(int i)
{
   return pow(2,log(i));
}
int main()
{
    printf("N value\tF1\tF2\tF3\tF4\tF5\tF6\tF7\tF8\t  F9\t  F10\n");
    for(int i=0;i<101;i++)
```

```
    {
          printf("n=%d\t %.2f\t %.2f\t %d\t %.2f\t
%.2f\t",i,f1(i),f2(i),f3(i),f4(i),f5(i));

          printf("%.3f\t %.3f\t
%.2f\t  %.2f\t  %.2f\n",f6(i),f7(i),f8(i),f9(i),f10(i));


    }

   }
```

Output:

1.Given below is the output containing values of all functions from n=0 to n=100 in tabular format.

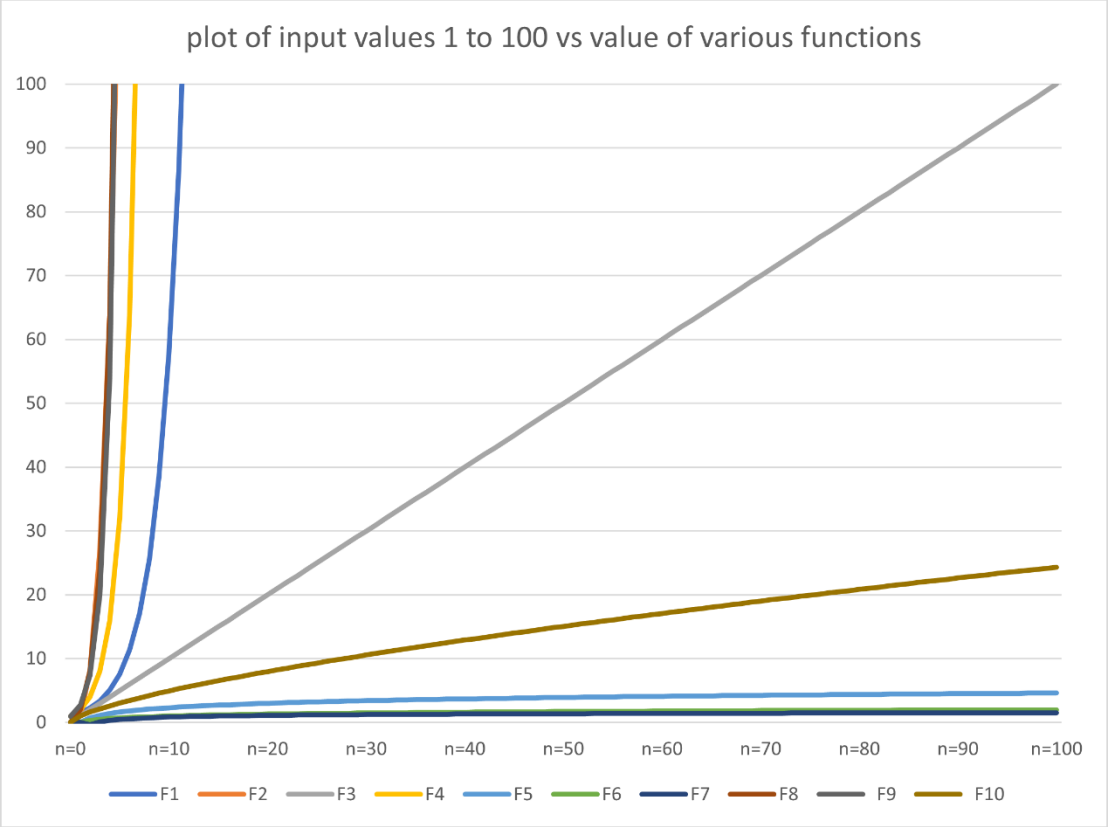
N value	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
n=0	1	0	0	1	-inf	#NAME?	-nan	0	1	0
n=1	1.5	1	1	2	0	0	-inf	2	2.71	1
n=2	2.25	8	2	4	0.69	0.301	-0.367	8	7.34	1.62
n=3	3.38	27	3	8	1.1	0.477	0.094	24	19.9	2.14
n=4	5.06	64	4	16	1.39	0.602	0.327	64	53.94	2.61
n=5	7.59	125	5	32	1.61	0.699	0.476	160	146.17	3.05
n=6	11.39	216	6	64	1.79	0.778	0.583	384	396.11	3.46
n=7	17.09	343	7	128	1.95	0.845	0.666	896	1073.46	3.85
n=8	25.63	512	8	256	2.08	0.903	0.732	2048	2909.07	4.23
n=9	38.44	729	9	512	2.2	0.954	0.787	4608	7883.58	4.59
n=10	57.67	1000	10	1024	2.3	1	0.834	10240	21364.51	4.93
n=11	86.5	1331	11	2048	2.4	1.041	0.875	22528	57897.82	5.27
n=12	129.75	1728	12	4096	2.48	1.079	0.91	49152	156903.1	5.6
n=13	194.62	2197	13	8192	2.56	1.114	0.942	106496	425207.4	5.92
n=14	291.93	2744	14	16384	2.64	1.146	0.97	229376	1152312	6.23

n=15	437.89	3375	15	32768	2.71	1.176	0.996	491520	3122765	6.53
n=16	656.84	4096	16	65536	2.77	1.204	1.02	1048576	8462694	6.83
n=17	985.26	4913	17	131072	2.83	1.23	1.041	2228224	22933902	7.13
n=18	1477.89	5832	18	262144	2.89	1.255	1.061	4718592	62150873	7.41
n=19	2216.84	6859	19	524288	2.94	1.279	1.08	9961472	1.68E+08	7.7
n=20	3325.26	8000	20	1048576	3	1.301	1.097	20971520	4.56E+08	7.98
n=21	4987.89	9261	21	2097152	3.04	1.322	1.113	44040192	1.24E+09	8.25
n=22	7481.83	10648	22	4194304	3.09	1.342	1.129	92274688	3.35E+09	8.52
n=23	11222.74	12167	23	8388608	3.14	1.362	1.143	1.93E+08	9.08E+09	8.79
n=24	16834.11	13824	24	16777216	3.18	1.38	1.156	4.03E+08	2.46E+10	9.05
n=25	25251.17	15625	25	33554432	3.22	1.398	1.169	8.39E+08	6.67E+10	9.31
n=26	37876.75	17576	26	67108864	3.26	1.415	1.181	1.74E+09	1.81E+11	9.57
n=27	56815.13	19683	27	1.34E+08	3.3	1.431	1.193	3.62E+09	4.9E+11	9.82
n=28	85222.69	21952	28	2.68E+08	3.33	1.447	1.204	7.52E+09	1.33E+12	10.07
n=29	127834	24389	29	5.37E+08	3.37	1.462	1.214	1.56E+10	3.6E+12	10.32
n=30	191751.1	27000	30	1.07E+09	3.4	1.477	1.224	3.22E+10	9.75E+12	10.56
n=31	287626.6	29791	31	2.15E+09	3.43	1.491	1.234	6.66E+10	2.64E+13	10.81
n=32	431439.9	32768	32	4.29E+09	3.47	1.505	1.243	1.37E+11	7.16E+13	11.05
n=33	647159.8	35937	33	8.59E+09	3.5	1.519	1.252	2.83E+11	1.94E+14	11.29
n=34	970739.7	39304	34	1.72E+10	3.53	1.531	1.26	5.84E+11	5.26E+14	11.52
n=35	1456110	42875	35	3.44E+10	3.56	1.544	1.268	1.2E+12	1.43E+15	11.76
n=36	2184164	46656	36	6.87E+10	3.58	1.556	1.276	2.47E+12	3.86E+15	11.99
n=37	3276247	50653	37	1.37E+11	3.61	1.568	1.284	5.09E+12	1.05E+16	12.22
n=38	4914370	54872	38	2.75E+11	3.64	1.58	1.291	1.04E+13	2.84E+16	12.45
n=39	7371555	59319	39	5.5E+11	3.66	1.591	1.298	2.14E+13	7.69E+16	12.67
n=40	11057332	64000	40	1.1E+12	3.69	1.602	1.305	4.4E+13	2.08E+17	12.9
n=41	16585998	68921	41	2.2E+12	3.71	1.613	1.312	9.02E+13	5.65E+17	13.12
n=42	24878998	74088	42	4.4E+12	3.74	1.623	1.318	1.85E+14	1.53E+18	13.34
n=43	37318497	79507	43	8.8E+12	3.76	1.633	1.325	3.78E+14	4.15E+18	13.56
n=44	55977745	85184	44	1.76E+13	3.78	1.643	1.331	7.74E+14	1.12E+19	13.78
n=45	83966617	91125	45	3.52E+13	3.81	1.653	1.337	1.58E+15	3.05E+19	13.99
n=46	1.26E+08	97336	46	7.04E+13	3.83	1.663	1.343	3.24E+15	8.25E+19	14.21
n=47	1.89E+08	103823	47	1.41E+14	3.85	1.672	1.348	6.61E+15	2.24E+20	14.42
n=48	2.83E+08	110592	48	2.81E+14	3.87	1.681	1.354	1.35E+16	6.06E+20	14.63
n=49	4.25E+08	117649	49	5.63E+14	3.89	1.69	1.359	2.76E+16	1.64E+21	14.84
n=50	6.38E+08	125000	50	1.13E+15	3.91	1.699	1.364	5.63E+16	4.45E+21	15.05
n=51	9.56E+08	132651	51	2.25E+15	3.93	1.708	1.369	1.15E+17	1.21E+22	15.26
n=52	1.43E+09	140608	52	4.5E+15	3.95	1.716	1.374	2.34E+17	3.27E+22	15.47
n=53	2.15E+09	148877	53	9.01E+15	3.97	1.724	1.379	4.77E+17	8.86E+22	15.67
n=54	3.23E+09	157464	54	1.8E+16	3.99	1.732	1.384	9.73E+17	2.4E+23	15.88
n=55	4.84E+09	166375	55	3.6E+16	4.01	1.74	1.388	1.98E+18	6.51E+23	16.08
n=56	7.26E+09	175616	56	7.21E+16	4.03	1.748	1.393	4.04E+18	1.76E+24	16.28
n=57	1.09E+10	185193	57	1.44E+17	4.04	1.756	1.397	8.21E+18	4.78E+24	16.48
n=58	1.63E+10	195112	58	2.88E+17	4.06	1.763	1.401	1.67E+19	1.29E+25	16.68
n=59	2.45E+10	205379	59	5.76E+17	4.08	1.771	1.405	3.4E+19	3.51E+25	16.88
n=60	3.68E+10	216000	60	1.15E+18	4.09	1.778	1.41	6.92E+19	9.51E+25	17.08
n=61	5.52E+10	226981	61	2.31E+18	4.11	1.785	1.414	1.41E+20	2.58E+26	17.28

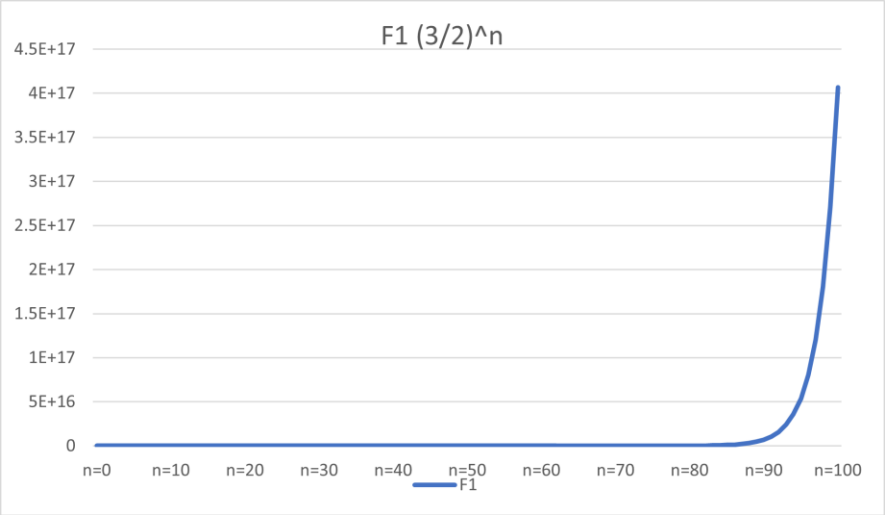
n=62	8.27E+10	238328	62	4.61E+18	4.13	1.792	1.418	2.86E+20	6.98E+26	17.47
n=63	1.24E+11	250047	63	9.22E+18	4.14	1.799	1.421	5.81E+20	1.89E+27	17.67
n=64	1.86E+11	262144	64	1.84E+19	4.16	1.806	1.425	1.18E+21	5.13E+27	17.86
n=65	2.79E+11	274625	65	3.69E+19	4.17	1.813	1.429	2.4E+21	1.39E+28	18.06
n=66	4.19E+11	287496	66	7.38E+19	4.19	1.82	1.433	4.87E+21	3.77E+28	18.25
n=67	6.28E+11	300763	67	1.48E+20	4.2	1.826	1.436	9.89E+21	1.02E+29	18.44
n=68	9.42E+11	314432	68	2.95E+20	4.22	1.833	1.44	2.01E+22	2.77E+29	18.63
n=69	1.41E+12	328509	69	5.9E+20	4.23	1.839	1.443	4.07E+22	7.5E+29	18.82
n=70	2.12E+12	343000	70	1.18E+21	4.25	1.845	1.447	8.26E+22	2.03E+30	19.01
n=71	3.18E+12	357911	71	2.36E+21	4.26	1.851	1.45	1.68E+23	5.51E+30	19.2
n=72	4.77E+12	373248	72	4.72E+21	4.28	1.857	1.453	3.4E+23	1.49E+31	19.38
n=73	7.16E+12	389017	73	9.44E+21	4.29	1.863	1.456	6.89E+23	4.04E+31	19.57
n=74	1.07E+13	405224	74	1.89E+22	4.3	1.869	1.46	1.4E+24	1.1E+32	19.75
n=75	1.61E+13	421875	75	3.78E+22	4.32	1.875	1.463	2.83E+24	2.97E+32	19.94
n=76	2.42E+13	438976	76	7.56E+22	4.33	1.881	1.466	5.74E+24	8.05E+32	20.12
n=77	3.62E+13	456533	77	1.51E+23	4.34	1.886	1.469	1.16E+25	2.18E+33	20.31
n=78	5.43E+13	474552	78	3.02E+23	4.36	1.892	1.472	2.36E+25	5.91E+33	20.49
n=79	8.15E+13	493039	79	6.04E+23	4.37	1.898	1.475	4.78E+25	1.6E+34	20.67
n=80	1.22E+14	512000	80	1.21E+24	4.38	1.903	1.478	9.67E+25	4.34E+34	20.85
n=81	1.83E+14	531441	81	2.42E+24	4.39	1.908	1.48	1.96E+26	1.18E+35	21.03
n=82	2.75E+14	551368	82	4.84E+24	4.41	1.914	1.483	3.97E+26	3.19E+35	21.21
n=83	4.13E+14	571787	83	9.67E+24	4.42	1.919	1.486	8.03E+26	8.64E+35	21.39
n=84	6.19E+14	592704	84	1.93E+25	4.43	1.924	1.489	1.62E+27	2.34E+36	21.57
n=85	9.28E+14	614125	85	3.87E+25	4.44	1.929	1.491	3.29E+27	6.34E+36	21.75
n=86	1.39E+15	636056	86	7.74E+25	4.45	1.934	1.494	6.65E+27	1.72E+37	21.92
n=87	2.09E+15	658503	87	1.55E+26	4.47	1.94	1.496	1.35E+28	4.66E+37	22.1
n=88	3.13E+15	681472	88	3.09E+26	4.48	1.944	1.499	2.72E+28	1.26E+38	22.27
n=89	4.7E+15	704969	89	6.19E+26	4.49	1.949	1.502	5.51E+28	3.42E+38	22.45
n=90	7.05E+15	729000	90	1.24E+27	4.5	1.954	1.504	1.11E+29	9.27E+38	22.62
n=91	1.06E+16	753571	91	2.48E+27	4.51	1.959	1.506	2.25E+29	2.51E+39	22.8
n=92	1.59E+16	778688	92	4.95E+27	4.52	1.964	1.509	4.56E+29	6.81E+39	22.97
n=93	2.38E+16	804357	93	9.9E+27	4.53	1.968	1.511	9.21E+29	1.85E+40	23.14
n=94	3.57E+16	830584	94	1.98E+28	4.54	1.973	1.514	1.86E+30	5E+40	23.32
n=95	5.35E+16	857375	95	3.96E+28	4.55	1.978	1.516	3.76E+30	1.36E+41	23.49
n=96	8.03E+16	884736	96	7.92E+28	4.56	1.982	1.518	7.61E+30	3.67E+41	23.66
n=97	1.2E+17	912673	97	1.58E+29	4.57	1.987	1.521	1.54E+31	9.95E+41	23.83
n=98	1.81E+17	941192	98	3.17E+29	4.58	1.991	1.523	3.11E+31	2.7E+42	24
n=99	2.71E+17	970299	99	6.34E+29	4.6	1.996	1.525	6.27E+31	7.31E+42	24.17
n=100	4.07E+17	1000000	100	1.27E+30	4.61	2	1.527	1.27E+32	1.98E+43	24.34

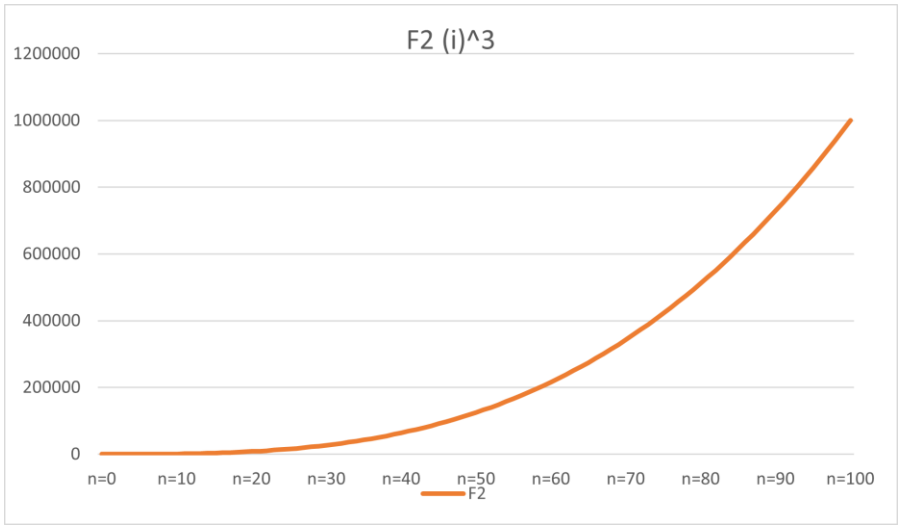
2. 2D plot of all functions such that x-axis represents the values of n and y-axis represent the function value

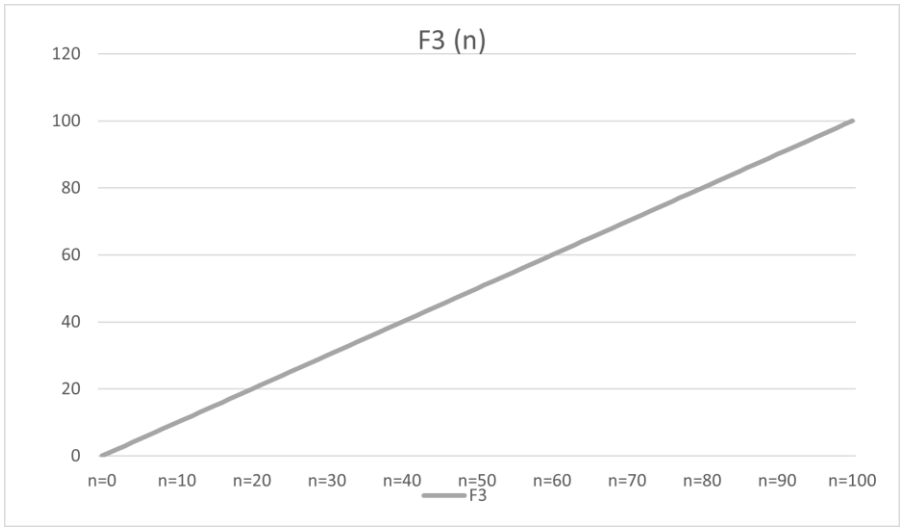
Plot of all functions values together:

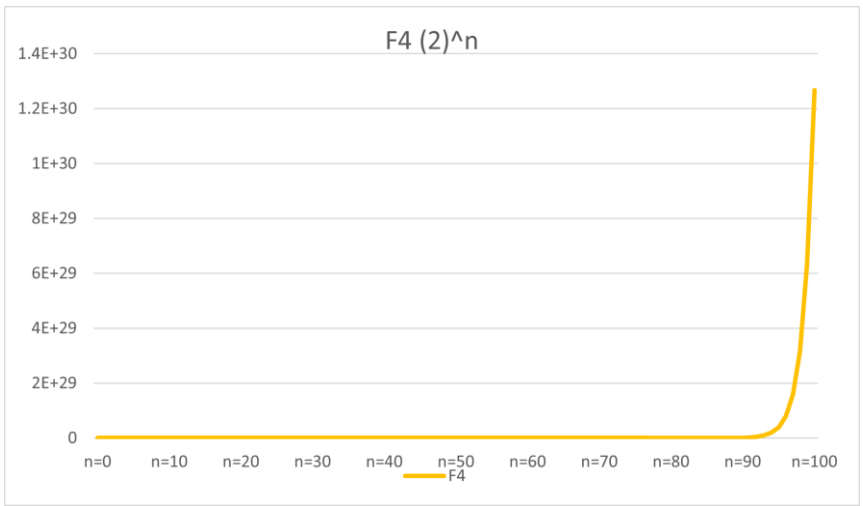


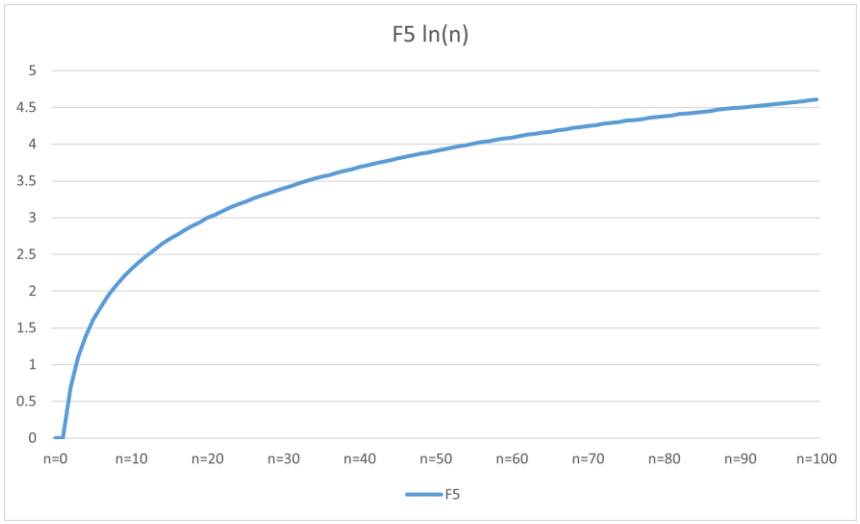
Plot of all functions individually against n values:



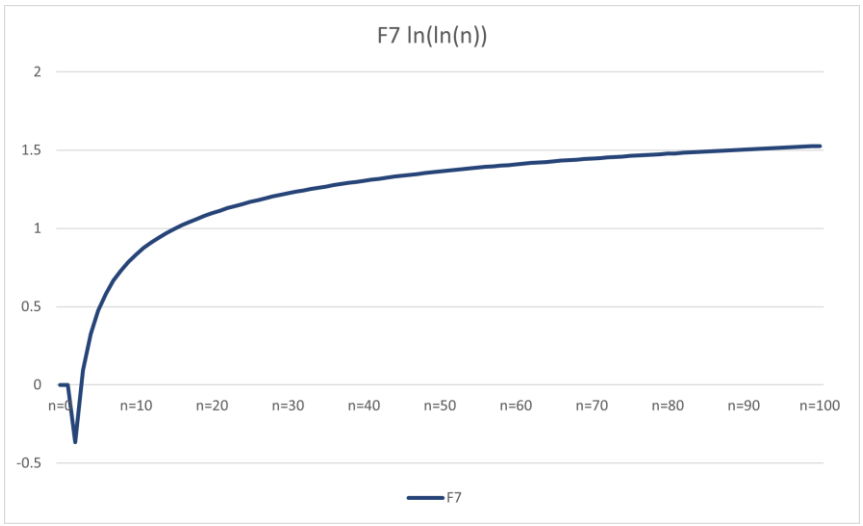

F2 (i)^3
1200000
1000000
800000
600000
400000
200000
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F2

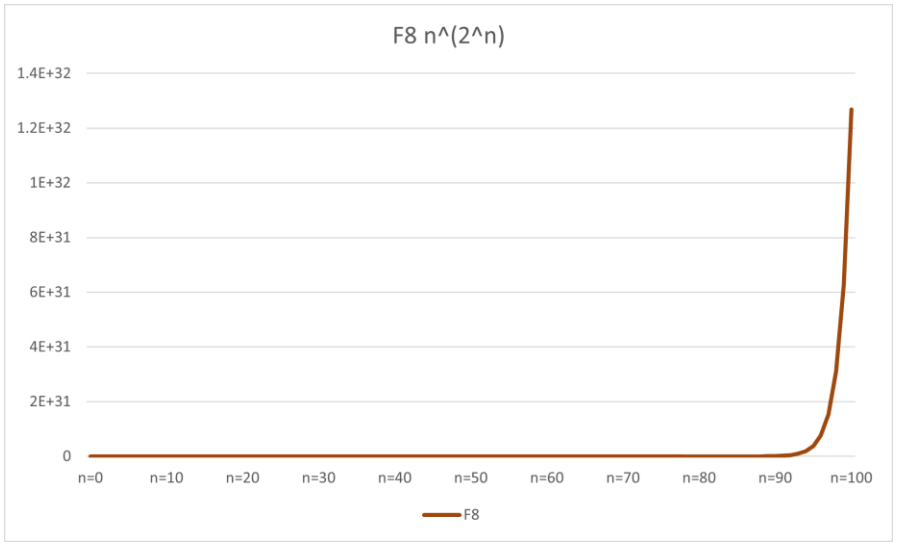

F3 (n)
120
100
80
60
40
20
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F3

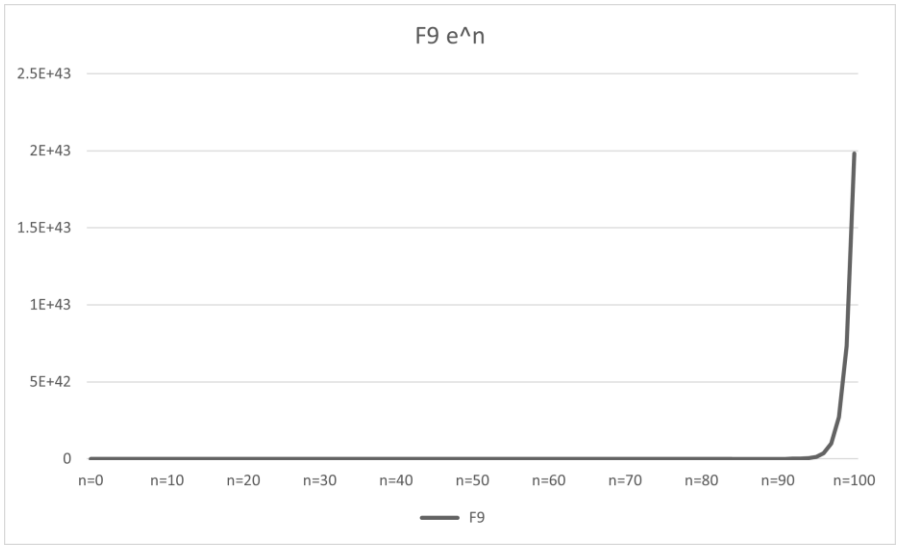

F4 (2)^n
1.4E+30
1.2E+30
1E+30
8E+29
6E+29
4E+29
2E+29
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F4

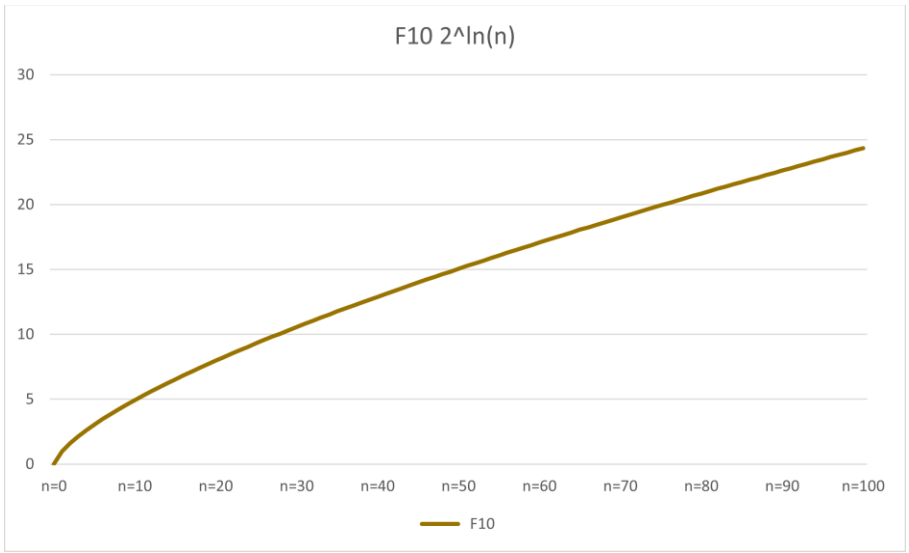

F5 ln(n)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F5


F6 log(n)
2.5
2
1.5
1
0.5
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F6


F7 ln(ln(n))
2
1.5
1
0.5
0
-0.5
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F7


F8 n^(2^n)
1.4E+32
1.2E+32
1E+32
8E+31
6E+31
4E+31
2E+31
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F8


F9 e^n
2.5E+43
2E+43
1.5E+43
1E+43
5E+42
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F9


F10 2^ln(n)
30
25
20
15
10
5
0
n=0
n=10
n=20
n=30
n=40
n=50
n=60
n=70
n=80
n=90
n=100
F10

Observation:

The graphs for function F1 (3/2)^n,F2 i^3,F4 2^n,F8 n^(2^n) ,F9 e^n show exponential nature in the graph whose value is changing exponentially in the n value range of 90 to 100 except for F2=i^3 whose value rises exponentially in the range of n=30.

The graph of function F3 is simply a straight line passing through origin.

The graph of F5 ln(n) , F6 log(n) and F7 ln(ln(n)) are almost similar and increasing logarithmically except for F7 whose value is not define at n=0 and it shows logarithmic behaviour starting from n=2 having value -0.367

The graph of F10 is also increasingly logarithmically with function values changing very slowly as n value increases.