DIGITAL ANALYSIS AND ALGORITHM

EXPERIMENT - 01

NAME :- MANTHAN AYALWAR

UID :- 2021700003

BATCH :- D1

PART - 1A

Aim :- To implement the various functions e.g. linear, non-linear, quadratic, exponential etc.

Code :-

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

void fun1(int n){          //n cube
    int res=n*n*n;
    printf("%d\t",res);
}

void fun2(int n){    // log n
    double res=log(n);
     printf("%.3f\t",res);
}

void fun3(int n){         // nlogn
    double res=n*log(n);
    printf("%.3f\t",res);
}

void fun4(int n){      // 2^logn

    double res = pow(2,log(n));
    printf("%.3f\t",res);
}

void fun5(int n){
```

```c
    double res = pow(log2(n),0.5); // sqrt(log2n)
    printf("%.3f\t",res);
}

void fun6(int n){    // log2 n
   double res=log2(n);
    printf("%.3f\t",res);
}

void fun7(int n){   // ln ln n
    double res = log(log(n));
    printf("%.3f\t",res);
}

void fun8(int n){    // (root 2)^ log2n
    double res = pow(1.4142,log2(n));
     printf("%.3f\t",res);
}

void fun9(int n){    // n^ (lglgn)
    double res = pow(2,2*log2(n));
     printf("%.2f\t",res);
}

void fun10(int n){    // log2 n
   double res=pow(log2(n),2);
  printf("%.3f\t",res);
}
int main()
{
    printf("n\t");
    printf("fun1\t");
    printf("fun2\t");
    printf("fun3\t");
    printf("fun4\t");
    printf("fun5\t");
    printf("fun6\t");
    printf("fun7\t");
    printf("fun8\t");
    printf("fun9\t");
    printf("fun10\t");
    printf("\n");
    for(int i = 0 ;i<100;i++){
        printf("%d\t",i);
        fun1(i);
        fun2(i);
        fun3(i);
        fun4(i);
```

```
        fun5(i);
        fun6(i);
        fun7(i);
        fun8(i);
        fun9(i);
        fun10(i);
        printf("\n");
    }

    return 0;
}
```

Output :-

n	fun1	fun2	fun3	fun4	fun5	fun6	fun7	fun8	fun9	fun10
0	0	-inf	-nan	0.000	inf	-inf	-nan	0.000	0.00	inf
1	1	0.000	0.000	1.000	0.000	0.000	-inf	1.000	1.00	0.000
2	8	0.693	1.386	1.617	1.000	1.000	-0.367	1.414	4.00	1.000
3	27	1.099	3.296	2.141	1.259	1.585	0.094	1.732	9.00	2.512
4	64	1.386	5.545	2.614	1.414	2.000	0.327	2.000	16.00	4.000
5	125	1.609	8.047	3.051	1.524	2.322	0.476	2.236	25.00	5.391
6	216	1.792	10.751	3.462	1.608	2.585	0.583	2.449	36.00	6.682
7	343	1.946	13.621	3.853	1.676	2.807	0.666	2.646	49.00	7.881
8	512	2.079	16.636	4.226	1.732	3.000	0.732	2.828	64.00	9.000
9	729	2.197	19.775	4.586	1.780	3.170	0.787	3.000	81.00	10.048
10	1000	2.303	23.026	4.933	1.823	3.322	0.834	3.162	100.00	11.035
11	1331	2.398	26.377	5.270	1.860	3.459	0.875	3.317	121.00	11.968
12	1728	2.485	29.819	5.598	1.893	3.585	0.910	3.464	144.00	12.852
13	2197	2.565	33.344	5.917	1.924	3.700	0.942	3.605	169.00	13.693
14	2744	2.639	36.947	6.229	1.951	3.807	0.970	3.742	196.00	14.496
15	3375	2.708	40.621	6.534	1.977	3.907	0.996	3.873	225.00	15.264
16	4096	2.773	44.361	6.833	2.000	4.000	1.020	4.000	256.00	16.000
17	4913	2.833	48.165	7.127	2.022	4.087	1.041	4.123	289.00	16.707
18	5832	2.890	52.027	7.415	2.042	4.170	1.061	4.242	324.00	17.388
19	6859	2.944	55.944	7.698	2.061	4.248	1.080	4.359	361.00	18.045
20	8000	2.996	59.915	7.976	2.079	4.322	1.097	4.472	400.00	18.679

21	9261	3.045	63.935	8.251	2.096	4.392	1.113	4.582	441.00	19.292
22	10648	3.091	68.003	8.521	2.112	4.459	1.129	4.690	484.00	19.887
23	12167	3.135	72.116	8.788	2.127	4.524	1.143	4.796	529.00	20.463
24	13824	3.178	76.273	9.051	2.141	4.585	1.156	4.899	576.00	21.022
25	15625	3.219	80.472	9.311	2.155	4.644	1.169	5.000	625.00	21.565
26	17576	3.258	84.711	9.567	2.168	4.700	1.181	5.099	676.00	22.094
27	19683	3.296	88.988	9.821	2.181	4.755	1.193	5.196	729.00	22.609
28	21952	3.332	93.302	10.071	2.193	4.807	1.204	5.291	784.00	23.111
29	24389	3.367	97.652	10.319	2.204	4.858	1.214	5.385	841.00	23.600
30	27000	3.401	102.036	10.565	2.215	4.907	1.224	5.477	900.00	24.078
31	29791	3.434	106.454	10.808	2.226	4.954	1.234	5.567	961.00	24.544
32	32768	3.466	110.904	11.048	2.236	5.000	1.243	5.657	1024.00	25.000
33	35937	3.497	115.385	11.286	2.246	5.044	1.252	5.744	1089.00	25.446
34	39304	3.526	119.896	11.522	2.256	5.087	1.260	5.831	1156.00	25.882
35	42875	3.555	124.437	11.756	2.265	5.129	1.268	5.916	1225.00	26.310
36	46656	3.584	129.007	11.988	2.274	5.170	1.276	6.000	1296.00	26.728
37	50653	3.611	133.604	12.218	2.282	5.209	1.284	6.082	1369.00	27.138
38	54872	3.638	138.228	12.446	2.291	5.248	1.291	6.164	1444.00	27.541
39	59319	3.664	142.879	12.672	2.299	5.285	1.298	6.245	1521.00	27.935
40	64000	3.689	147.555	12.896	2.307	5.322	1.305	6.324	1600.00	28.323
41	68921	3.714	152.256	13.119	2.315	5.358	1.312	6.403	1681.00	28.703
42	74088	3.738	156.982	13.340	2.322	5.392	1.318	6.480	1764.00	29.077
43	79507	3.761	161.732	13.559	2.329	5.426	1.325	6.557	1849.00	29.444

44	85184	3.784	166.504		13.777	2.337	5.459	1.331	6.633	1936.00
	29.805									
45	91125	3.807	171.300		13.993	2.343	5.492	1.337	6.708	2025.00
	30.160									
46	97336	3.829	176.118		14.208	2.350	5.524	1.343	6.782	2116.00
	30.510									
47	103823	3.850	180.957		14.421	2.357	5.555	1.348	6.855	2209.00
	30.853									
48	110592	3.871	185.818		14.633	2.363	5.585	1.354	6.928	2304.00
	31.192									
49	117649	3.892	190.699		14.844	2.370	5.615	1.359	7.000	2401.00
	31.525									
50	125000	3.912	195.601		15.053	2.376	5.644	1.364	7.071	2500.00
	31.853									
51	132651	3.932	200.523		15.262	2.382	5.672	1.369	7.141	2601.00
	32.176									
52	140608	3.951	205.465		15.468	2.388	5.700	1.374	7.211	2704.00
	32.495									
53	148877	3.970	210.425		15.674	2.393	5.728	1.379	7.280	2809.00
	32.809									
54	157464	3.989	215.405		15.878	2.399	5.755	1.384	7.348	2916.00
	33.119									
55	166375	4.007	220.403		16.082	2.404	5.781	1.388	7.416	3025.00
	33.424									
56	175616	4.025	225.420		16.284	2.410	5.807	1.393	7.483	3136.00
	33.725									
57	185193	4.043	230.454		16.485	2.415	5.833	1.397	7.549	3249.00
	34.023									
58	195112	4.060	235.506		16.685	2.420	5.858	1.401	7.615	3364.00
	34.316									
59	205379	4.078	240.575		16.883	2.425	5.883	1.405	7.681	3481.00
	34.605									
60	216000	4.094	245.661		17.081	2.430	5.907	1.410	7.746	3600.00
	34.891									
61	226981	4.111	250.763		17.278	2.435	5.931	1.414	7.810	3721.00
	35.174									
62	238328	4.127	255.882		17.474	2.440	5.954	1.418	7.874	3844.00
	35.452									

63	250047 4.143 35.728	261.017	17.669	2.445	5.977	1.421	7.937	3969.00
64	262144 4.159 36.000	266.169	17.863	2.449	6.000	1.425	8.000	4096.00
65	274625 4.174 36.269	271.335	18.056	2.454	6.022	1.429	8.062	4225.00
66	287496 4.190 36.535	276.517	18.248	2.459	6.044	1.433	8.124	4356.00
67	300763 4.205 36.797	281.714	18.439	2.463	6.066	1.436	8.185	4489.00
68	314432 4.220 37.057	286.927	18.629	2.467	6.087	1.440	8.246	4624.00
69	328509 4.234 37.314	292.153	18.819	2.472	6.109	1.443	8.306	4761.00
70	343000 4.248 37.568	297.395	19.007	2.476	6.129	1.447	8.366	4900.00
71	357911 4.263 37.819	302.650	19.195	2.480	6.150	1.450	8.426	5041.00
72	373248 4.277 38.068	307.920	19.382	2.484	6.170	1.453	8.485	5184.00
73	389017 4.290 38.314	313.204	19.568	2.488	6.190	1.456	8.543	5329.00
74	405224 4.304 38.557	318.501	19.754	2.492	6.209	1.460	8.602	5476.00
75	421875 4.317 38.798	323.812	19.939	2.496	6.229	1.463	8.660	5625.00
76	438976 4.331 39.037	329.136	20.122	2.500	6.248	1.466	8.717	5776.00
77	456533 4.344 39.273	334.473	20.306	2.503	6.267	1.469	8.774	5929.00
78	474552 4.357 39.506	339.823	20.488	2.507	6.285	1.472	8.831	6084.00
79	493039 4.369 39.738	345.186	20.670	2.511	6.304	1.475	8.888	6241.00
80	512000 4.382 39.967	350.562	20.851	2.514	6.322	1.478	8.944	6400.00
81	531441 4.394 40.194	355.950	21.031	2.518	6.340	1.480	8.999	6561.00

| 82	551368	4.407	40.418	361.351	21.211	2.521	6.358	1.483	9.055	6724.00
83	571787	4.419	40.641	366.764	21.390	2.525	6.375	1.486	9.110	6889.00
84	592704	4.431	40.862	372.189	21.568	2.528	6.392	1.489	9.165	7056.00
85	614125	4.443	41.080	377.625	21.746	2.532	6.409	1.491	9.219	7225.00
86	636056	4.454	41.297	383.074	21.923	2.535	6.426	1.494	9.273	7396.00
87	658503	4.466	41.512	388.534	22.099	2.538	6.443	1.496	9.327	7569.00
88	681472	4.477	41.724	394.006	22.275	2.542	6.459	1.499	9.380	7744.00
89	704969	4.489	41.935	399.489	22.450	2.545	6.476	1.502	9.433	7921.00
90	729000	4.500	42.144	404.983	22.624	2.548	6.492	1.504	9.486	8100.00
91	753571	4.511	42.351	410.488	22.798	2.551	6.508	1.506	9.539	8281.00
92	778688	4.522	42.557	416.005	22.972	2.554	6.524	1.509	9.591	8464.00
93	804357	4.533	42.761	421.532	23.145	2.557	6.539	1.511	9.643	8649.00
94	830584	4.543	42.963	427.070	23.317	2.560	6.555	1.514	9.695	8836.00
95	857375	4.554	43.163	432.618	23.488	2.563	6.570	1.516	9.746	9025.00
96	884736	4.564	43.362	438.177	23.660	2.566	6.585	1.518	9.797	9216.00
97	912673	4.575	43.559	443.747	23.830	2.569	6.600	1.521	9.848	9409.00
98	941192	4.585	43.754	449.327	24.000	2.572	6.615	1.523	9.899	9604.00
99	970299	4.595	43.948	454.917	24.170	2.575	6.629	1.525	9.949	9801.00

Graph :-

Graph of function 1 and 2 with n
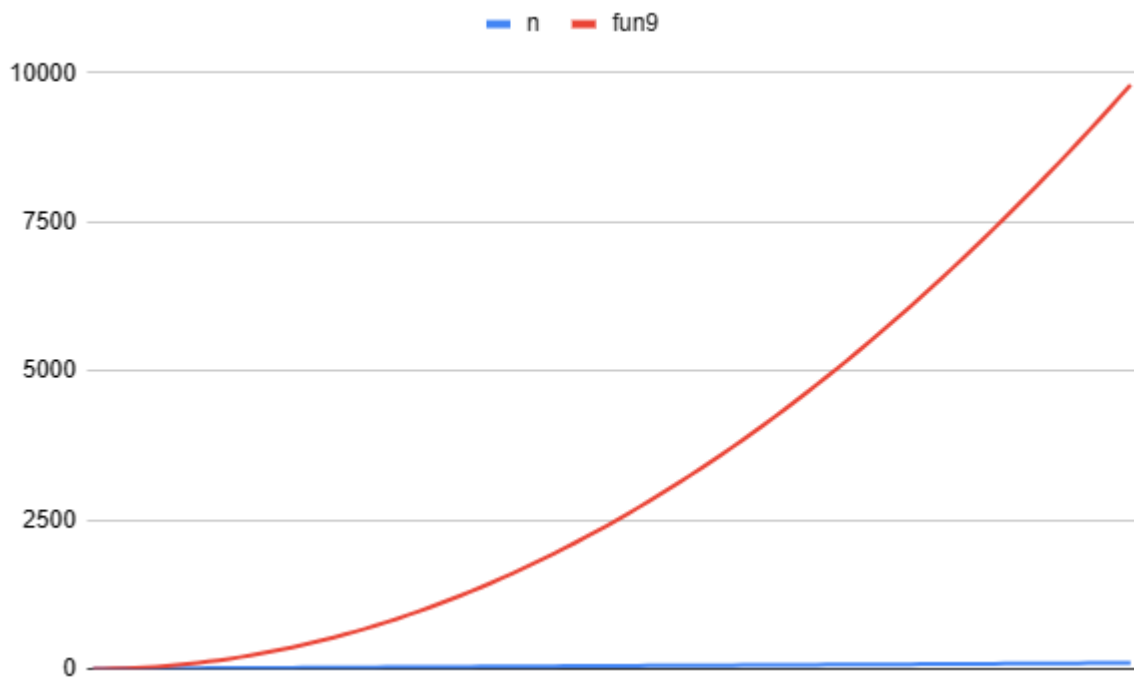
fun1/0/1 and fun2/-inf/0

n/0/1
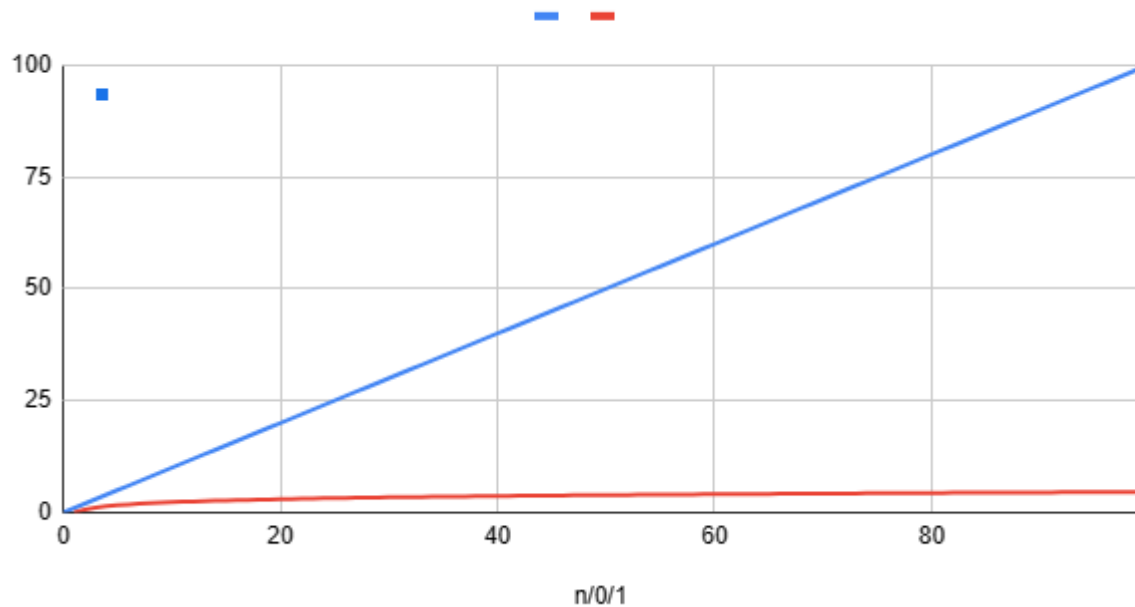
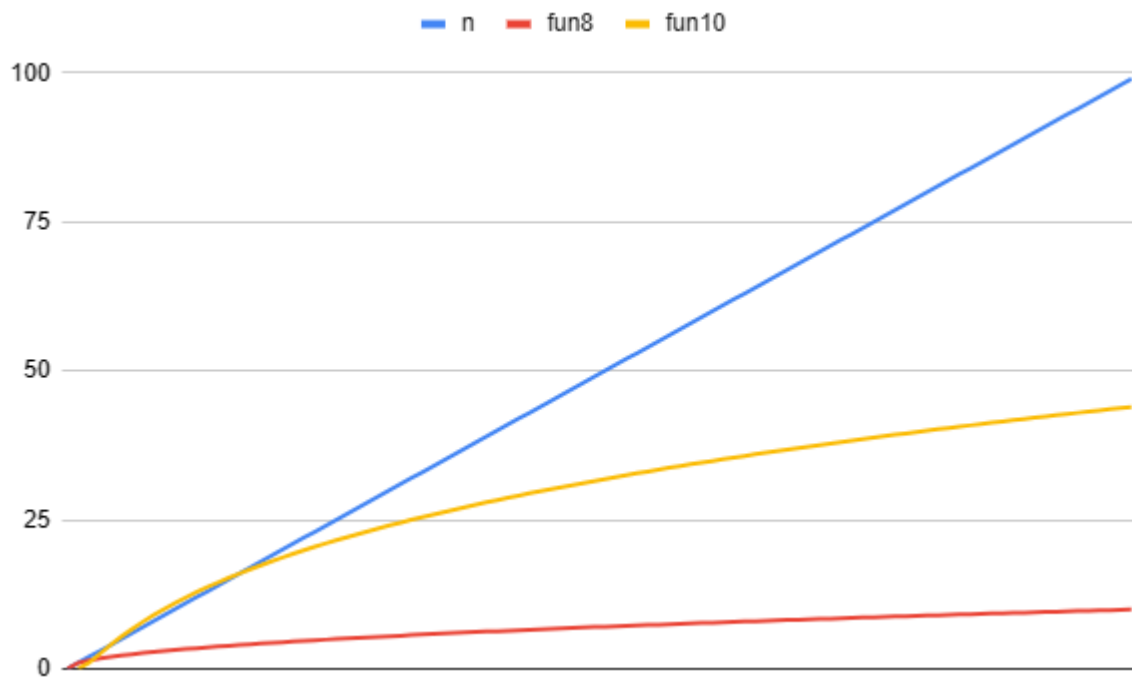Graph of function 3 and 4 with n
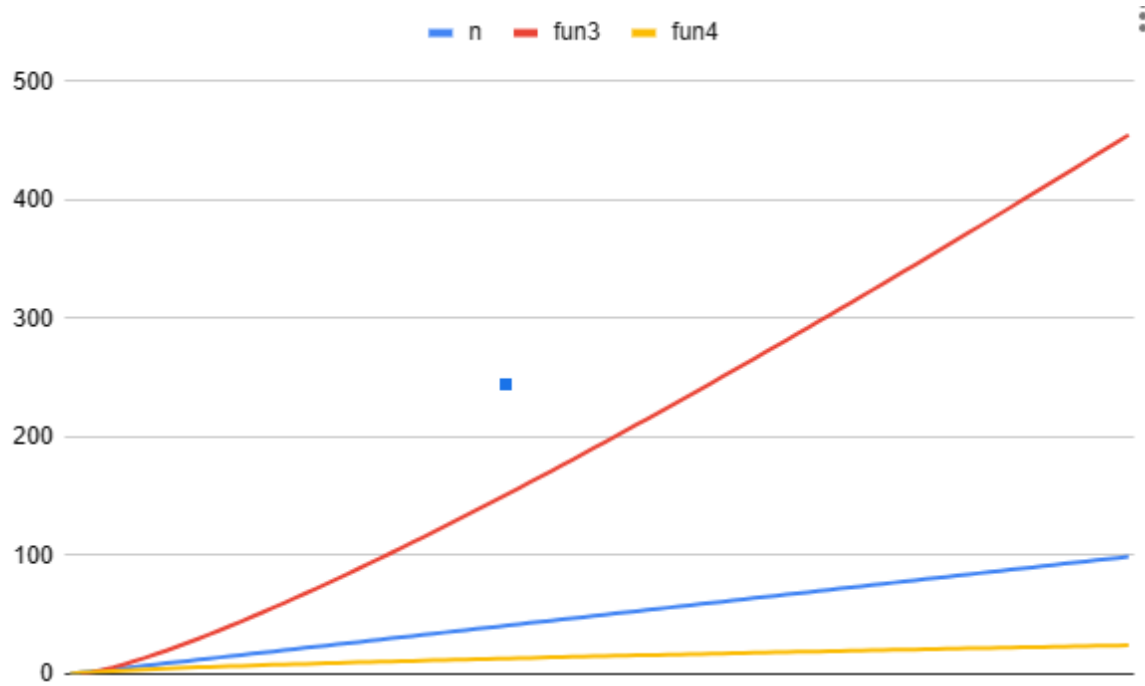
Graph of n with function 5 ,6 ,7 with n
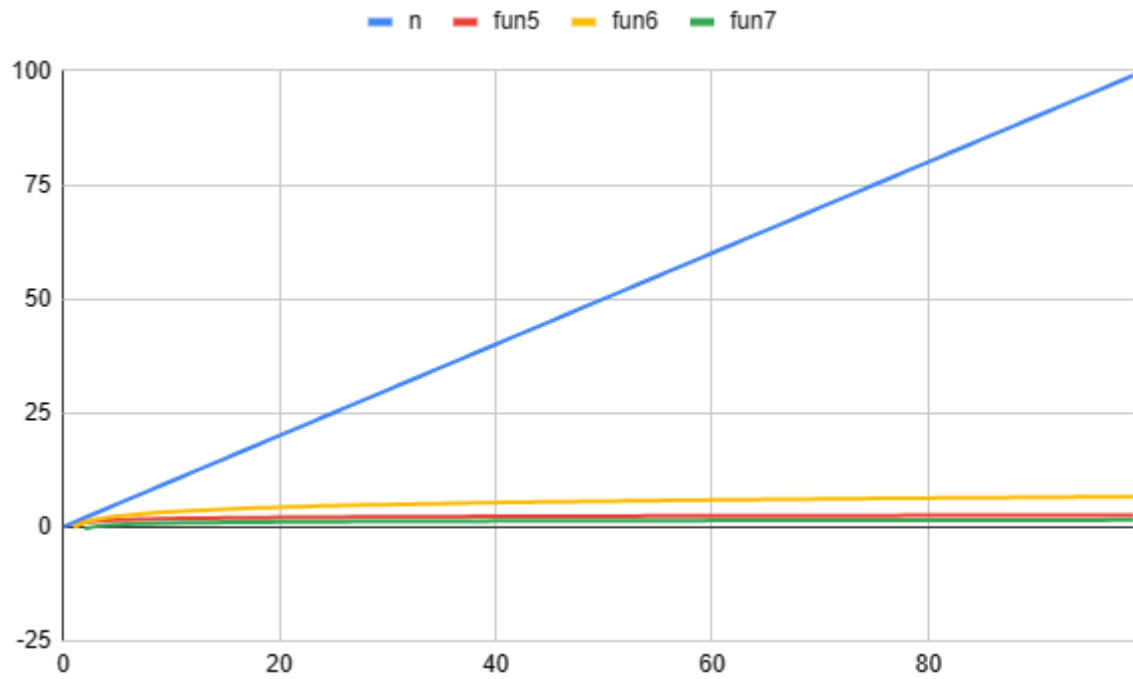
Graph of function 9 with n

Graph of function 8 and 10 with n

Code : -

```c
#include <stdio.h>
#include <math.h>
double factorial(double n)
{
    if (n == 0)
    {
        return 1;
    }
    return n * factorial(n - 1);
}

int main()
{
    double res;
    for (int i = 0; i < 21; i += 1)
    {
        res = factorial(i);
        printf("%f ", res);
    }
}
```

Output :-

1.000000 1.000000 2.000000 6.000000 24.000000 120.000000 720.000000 5040.000000 40320.000000 362880.000000 3628800.000000 39916800.000000 479001600.000000 6227020800.000000 87178291200.000000 1307674368000.000000 20922789888000.000000 355687428096000.000000 6402373705728000.000000 121645100408832000.000000 2432902008176640000.000000

Graph :
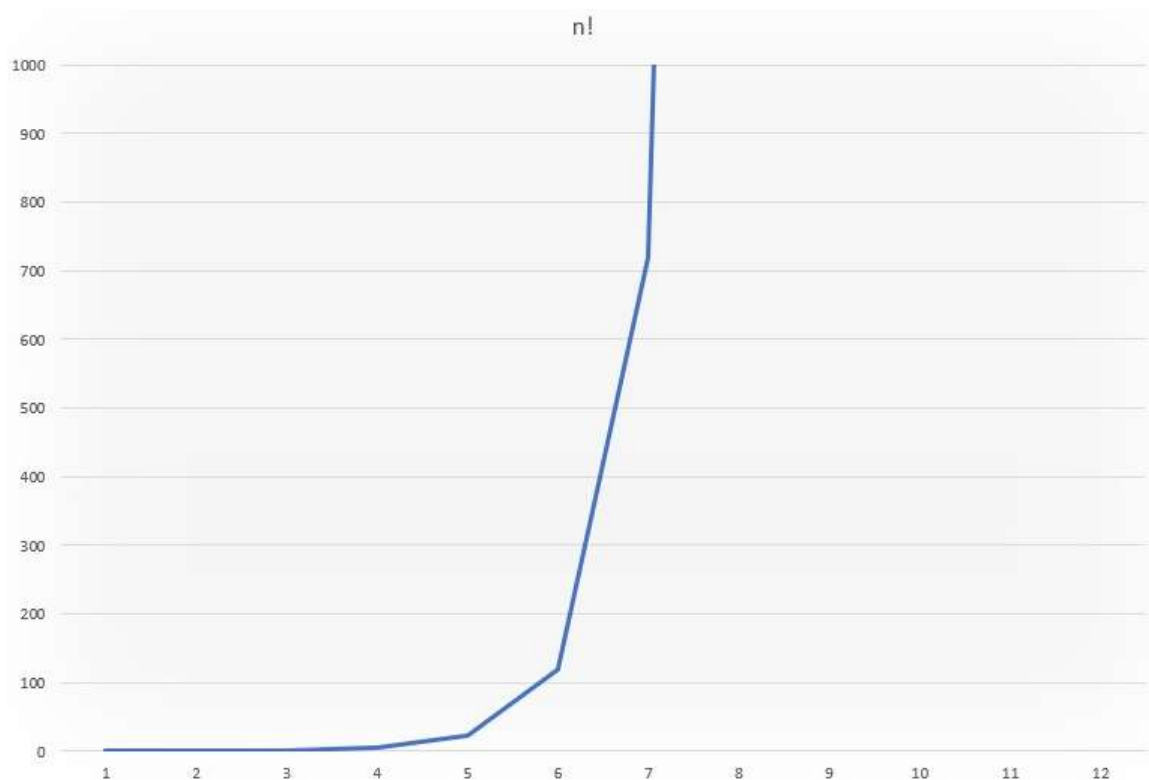
Observation : - In functions graph we observed some times slope is pretty high and sometimes slope is low. This is because the range of the number is widespread over the area. So the scale of graph is adjusted on taking that consideration.

In factorial graph , slope changes after certain time that is because there is no any pattern exist in factorial of number. Mostly , it increases rapidly with the number and it will reach infinite.

Conclusion : - Fron this experinment i learned to implement various function such as n cube , logn , nlogn in c language and also learned to plot a graph of this function with n .Secondly , I also learned to implement factorial in c language and also plot the graph in excel sheet.