DESIGN AND ANALYSIS OF ALGORITHMS LAB

NAME: Rahul Chalwadi

UID: 2021700012

BATCH: A

BRANCH: CSE DS

EXPT. NO.: 1A

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

CODE:

```c
#include <stdio.h>
#include <math.h>
double f1(int i){
    return pow((3.0/2.0),i);
}
double f2(int i){
    return pow(i,3);
}
double f3(int i){
    return i;
}
double f4(int i){
    return pow(2,i);
}
double f5(int i){
    return log(i);
}
double f6(int i){
    return (i*(log(i)));
}
double f7(int i){
    return (i *(pow(2,i)));
}
double f8(int i){
    return (pow(log(i),2));
}
double f9(int i){
    return ((log(i)/log(2)));
}
double f10(int i){
    return (i*(log(i)/log(2)));
}
int main()
{
    printf("input | f1 | f2 | f3 | f4 | f5 | f6 | f7 | f8 | f9 | f10 |\n");
```

```c
    for(int i=0;i<101;i++){
        //printf("%3d-->  %.2f  %.2f  %.2f  %.2f
",i,f1(i),f2(i),f3(i),f4(i));
        printf("%3d    ",i);
        printf("%.2f  ", f1(i));
        printf("%.2f  ", f2(i));
        printf("%.2f  ", f3(i));
        printf("%.2f  ", f4(i));
        printf("%.2f  ", f5(i));
        printf("%.2f  ", f6(i));
        printf("%.2f  ", f7(i));
        printf("%.2f  ", f8(i));
        printf("%.2f  ", f9(i));
        printf("%.2f\n ", f10(i));
    }

    return 0;
}
```
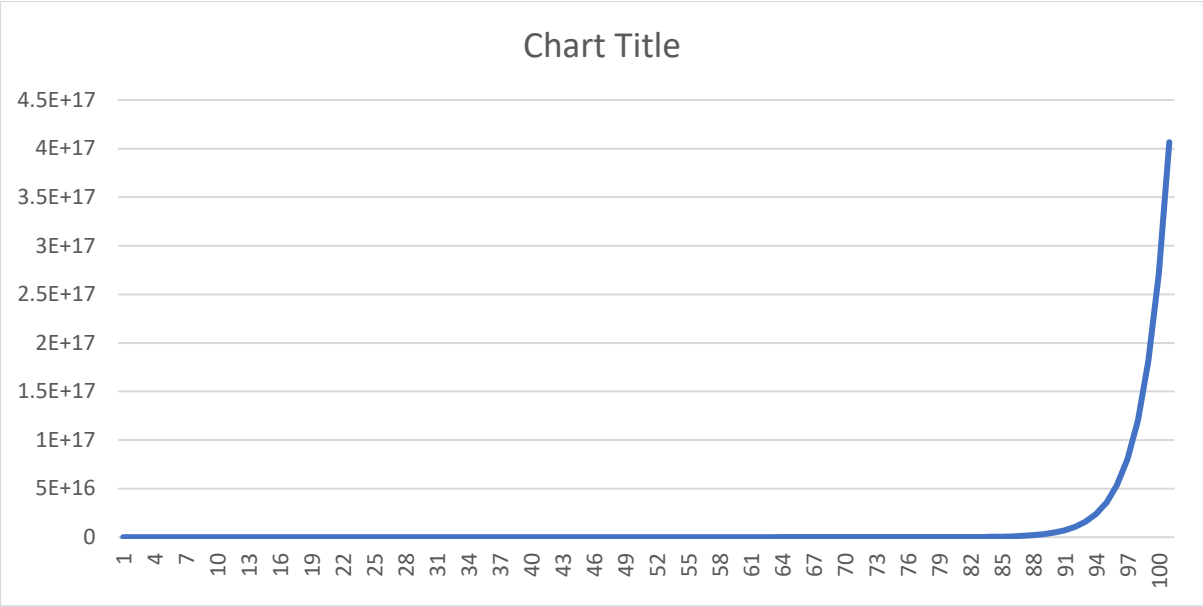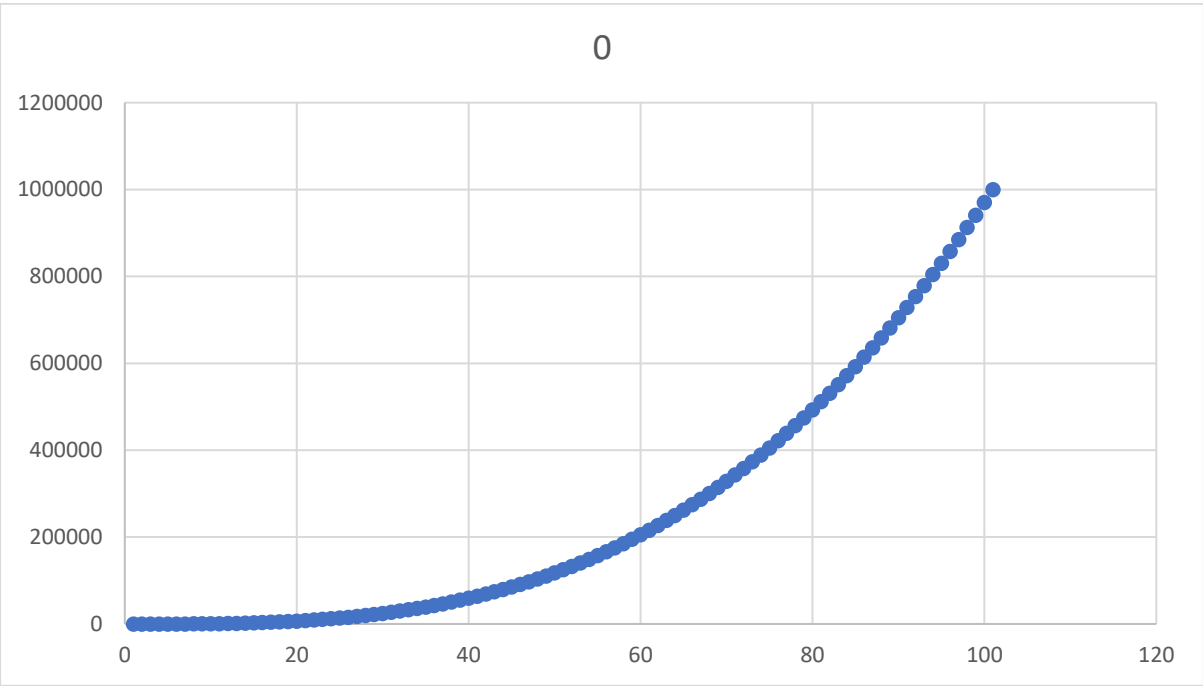
EXECUTION AND OUTPUT:

Excel — expdaa1.1 — Sheet "exp1daa"

Table 1 (rows 37–73):

35	1456109.61	42875	35	34359738368	3.56	124.44	1.2026E+12	12.64	5.13	179.52
36	2184164.41	46656	36	68719476736	3.58	129.01	2.4739E+12	12.84	5.17	186.12
37	3276246.61	50653	37	1.37439E+11	3.61	133.60	5.0852E+12	13.04	5.21	192.75
38	4914369.92	54872	38	2.74878E+11	3.64	138.23	1.0445E+13	13.23	5.25	199.42
39	7371554.88	59319	39	5.49756E+11	3.66	142.88	2.144E+13	13.42	5.29	206.13
40	11057332.3	64000	40	1.09951E+12	3.69	147.56	4.398E+13	13.61	5.32	212.88
41	16585998.5	68921	41	2.19902E+12	3.71	152.26	9.016E+13	13.79	5.36	219.66
42	24878997.7	74088	42	4.39805E+12	3.74	156.98	1.8472E+14	13.97	5.39	226.48
43	37318496.6	79507	43	8.79609E+12	3.76	161.73	3.7823E+14	14.15	5.43	235.33
44	55977744.9	85184	44	1.75922E+13	3.78	166.50	7.7406E+14	14.32	5.46	240.21
45	83966617.3	91125	45	3.51844E+13	3.81	171.30	1.5833E+15	14.49	5.49	247.13
46	125949926	97336	46	7.03687E+13	3.83	176.12	3.237E+15	14.66	5.52	254.08
47	188924889	103823	47	1.40737E+14	3.85	180.96	6.6147E+15	14.82	5.55	261.07
48	283387333	110592	48	2.81475E+14	3.87	185.82	1.3511E+16	14.99	5.58	268.08
49	425081000	117649	49	5.6295E+14	3.89	190.70	2.7585E+16	15.15	5.61	275.12
50	637621500	125000	50	1.1259E+15	3.91	195.60	5.6295E+16	15.30	5.64	282.19
51	956432250	132651	51	2.2518E+15	3.93	200.52	1.1484E+17	15.46	5.67	289.29
52	1434648375	140608	52	4.5036E+15	3.95	205.46	2.3419E+17	15.61	5.70	296.42
53	2151972563	148877	53	9.0072E+15	3.97	210.43	4.7738E+17	15.76	5.73	303.58
54	3227958845	157464	54	1.80144E+16	3.99	215.41	9.7278E+17	15.91	5.75	310.76
55	4841938267	166375	55	3.60288E+16	4.01	220.40	1.9816E+18	16.06	5.78	317.97
56	7262907401	175616	56	7.20576E+16	4.03	225.42	4.0352E+18	16.20	5.81	325.21
57	1.0894E+10	185193	57	1.44115E+17	4.04	230.45	8.2146E+18	16.35	5.83	332.47
58	1.6342E+10	195112	58	2.8823E+17	4.06	235.51	1.6717E+19	16.49	5.86	339.76
59	2.4512E+10	205379	59	5.76461E+17	4.08	240.57	3.4011E+19	16.63	5.88	347.08
60	3.6768E+10	216000	60	1.15292E+18	4.09	245.66	6.9175E+19	16.76	5.91	354.41
61	5.5153E+10	226981	61	2.30584E+18	4.11	250.76	1.4066E+20	16.90	5.93	361.77
62	8.2729E+10	238328	62	4.61169E+18	4.13	255.88	2.8592E+20	17.03	5.95	369.16
63	1.2409E+11	250047	63	9.22337E+18	4.14	261.02	5.8107E+20	17.17	5.98	376.57
64	1.8614E+11	262144	64	1.84467E+19	4.16	266.17	1.1806E+21	17.50	6.00	384.00
65	2.7921E+11	274625	65	3.68935E+19	4.17	271.34	2.3981E+21	17.43	6.02	391.45
66	4.1882E+11	287496	66	7.3787E+19	4.19	276.52	4.8699E+21	17.55	6.04	398.93
67	6.2822E+11	300763	67	1.47574E+20	4.20	281.71	9.8875E+21	17.68	6.07	406.43
68	9.4234E+11	314432	68	2.95148E+20	4.22	286.93	2.007E+22	17.80	6.09	413.95
69	1.4135E+12	328509	69	5.90296E+20	4.23	292.15	4.073E+22	17.93	6.11	421.49
70	2.1203E+12	343000	70	1.18059E+21	4.25	297.39	8.2641E+22	18.05	6.13	429.05
71	3.1804E+12	357911	71	2.36118E+21	4.26	302.65	1.6764E+23	18.17	6.15	436.63

Table 2 (rows 80–102):

B	C	D	E	F	G	H	I	J	K	L
78	5.43398E+13	474552	78	3.022E+23	4.36	339.82	2.8574E+25	18.98	6.29	490.26
79	8.15097E+13	493039	79	6.04463E+23	4.37	345.19	4.77526E+25	19.09	6.30	498.00
80	1.22265E+14	512000	80	1.20893E+24	4.38	350.56	9.67141E+25	19.20	6.32	505.75
81	1.83397E+14	531441	81	2.41785E+24	4.39	355.95	1.95846E+26	19.31	6.34	513.53
82	2.75095E+14	551368	82	4.8357E+24	4.41	361.35	3.96528E+26	19.42	6.36	521.32
83	4.12643E+14	571787	83	9.67141E+24	4.42	366.76	8.02727E+26	19.53	6.38	529.13
84	6.18965E+14	592704	84	1.93428E+25	4.43	372.19	1.6248E+27	19.63	6.39	536.95
85	9.28447E+14	614125	85	3.86856E+25	4.44	377.63	3.28828E+27	19.74	6.41	544.80
86	1.39267E+15	636056	86	7.73713E+25	4.45	383.07	6.65393E+27	19.84	6.43	552.66
87	2.08901E+15	658503	87	1.54743E+26	4.47	388.53	1.34626E+28	19.94	6.44	560.54
88	3.13351E+15	681472	88	3.09485E+26	4.48	394.01	2.72347E+28	20.05	6.46	568.43
89	4.70026E+15	704969	89	6.1897E+26	4.49	399.49	5.50883E+28	20.15	6.48	576.34
90	7.05039E+15	729000	90	1.23794E+27	4.50	404.98	1.11415E+29	20.25	6.49	584.27
91	1.05756E+16	753571	91	2.47588E+27	4.51	410.49	2.25305E+29	20.35	6.51	592.21
92	1.58634E+16	778688	92	4.95176E+27	4.52	416.00	4.55562E+29	20.45	6.52	600.17
93	2.37951E+16	804357	93	9.90352E+27	4.53	421.53	9.21027E+29	20.54	6.54	608.14
94	3.56926E+16	830584	94	1.9807E+28	4.54	427.07	1.86186E+30	20.64	6.55	616.13
95	5.35389E+16	857375	95	3.96141E+28	4.55	432.62	3.76334E+30	20.74	6.57	624.14
96	8.03084E+16	884736	96	7.92282E+28	4.56	438.18	7.6059E+30	20.83	6.58	632.16
97	1.20463E+17	912673	97	1.58456E+29	4.57	443.75	1.53703E+31	20.93	6.60	640.19
98	1.80694E+17	941192	98	3.16913E+29	4.58	449.33	3.10574E+31	21.02	6.61	648.24
99	2.71041E+17	970299	99	6.33825E+29	4.60	454.92	6.27487E+31	21.12	6.63	656.31
100	4.05561E+17	1000000	100	1.26765E+30	4.61	460.52	1.26765E+32	21.21	6.64	664.39

PLOTTING THESE FUNCTIONS IN EXCEL:

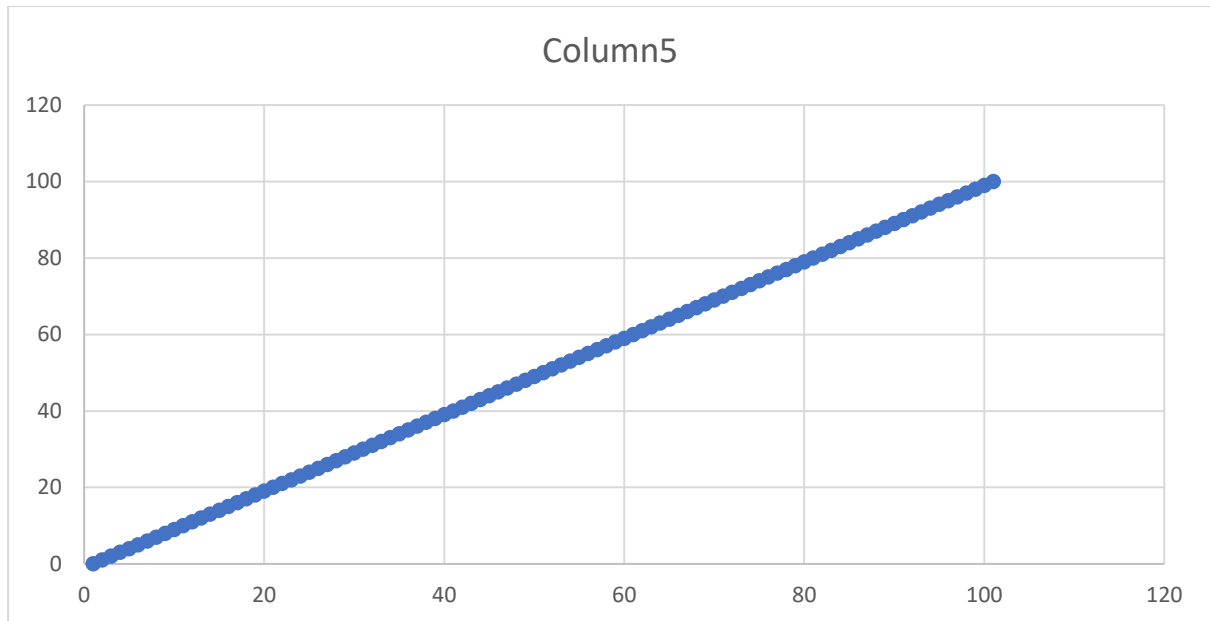In the following discussion, n is a non-negative integer.

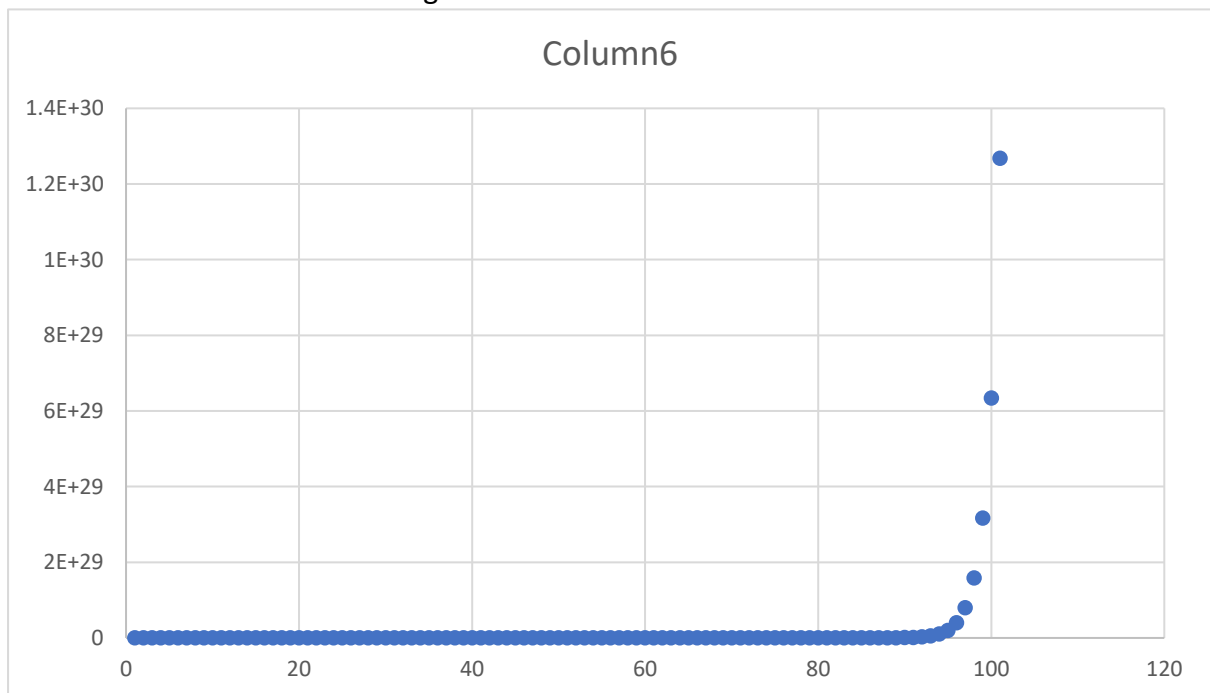**Function 1 is (3/2)^n where n is from 0 to 100**

Chart Title

Function 2 is n^3 where n is from 0 to 100

0

Function 3 is n where n is from 0 to 100
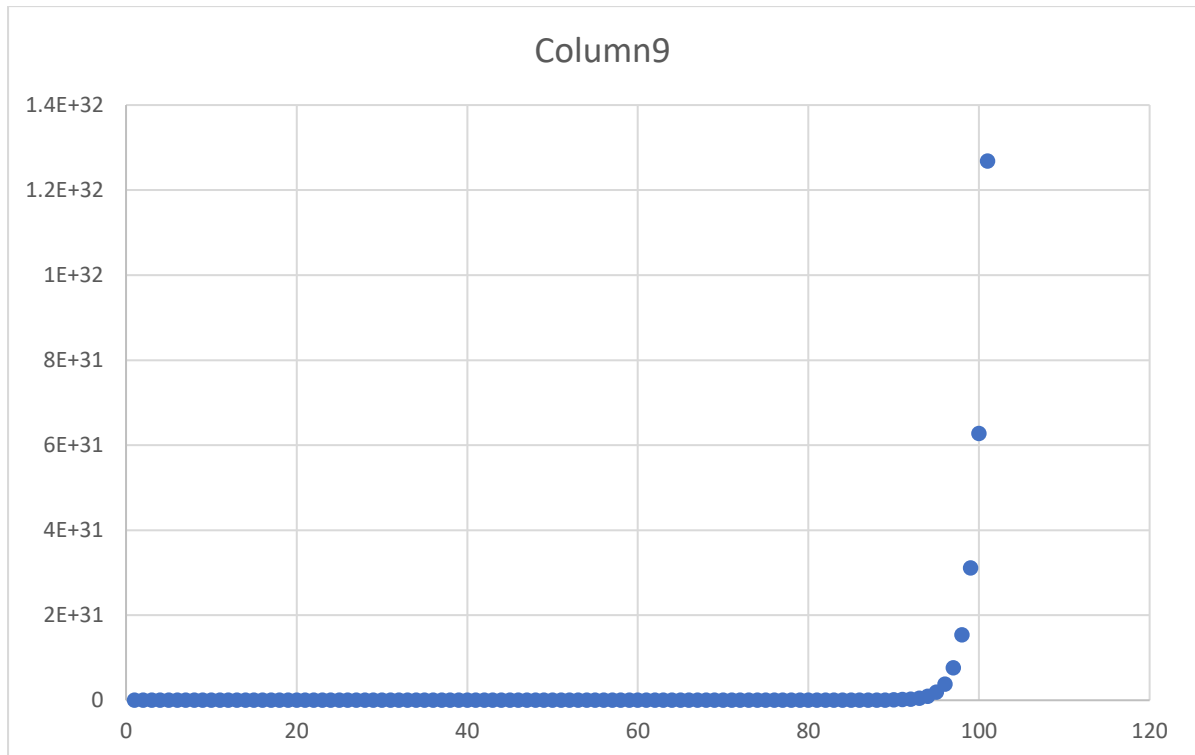

Function 4 is 2^n where n belong to 0 to 100

Function 5 is (log n) where n is from 0 to 100

Function 6 is n(log n) where n is from 0 to 100

Function 7 is n*2^n where n is from 0 to 100

Function 8 is (log n)^2 where n is from 0 to 100

Function 9 is (log n)/log 2 where n is from 0 to 100

Function 10 is n*((log n)/(log 2)) where n is from 0 to 100

CONCLUSION:

Final list of all functions in increasing order of their growth rates:

1. **(3/2)^n**
2. **n^3**
3. **n**
4. **2^n**
5. **(log n)**
6. **n(log n)**
7. **n*2^n**
8. **(log n)^2**
9. **(log n)/log 2**
10. **n*((log n)/(log 2))**