DESIGN AND ANALYSIS OF ALGORITHMS

EXPERIMENT 1 :

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CSE DS

D

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PART A:

AIM:
TO IMPLEMENT VARIOUS FUNCTIONS E.G. LINEAR, NON-LINEAR, QUADRATIC, EXPONENTIAL, ETC.

THEORY:
A function is a process or a relation that associates each element 'a' of a non-empty set A , at least to a single element 'b' of another non-empty set B.
A relation f from a set A (the domain of the function) to another set B (the co-domain of the function) is called a function in math. f = {(a,b)| for all a ∈ A, b ∈ B}

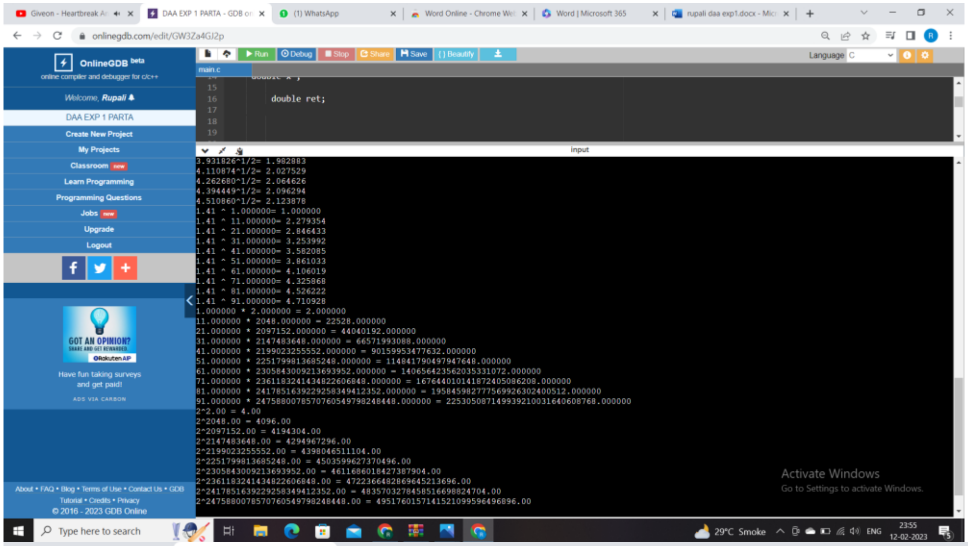
- A relation is said to be a function if every element of set A has one and only one image in set B.
- A function is a relation from a non-empty set B such that the domain of a function is A and no two distinct ordered pairs in f have the same first element.
- A function from A → B and (a,b) ∈ f, then f(a) = b, where 'b' is the image of 'a' under 'f' and 'a' is the preimage of 'b' under 'f'.
- If there exists a function f: A → B, the set A is called the domain of the function f, and the set B is called its co-domain.

CODE :

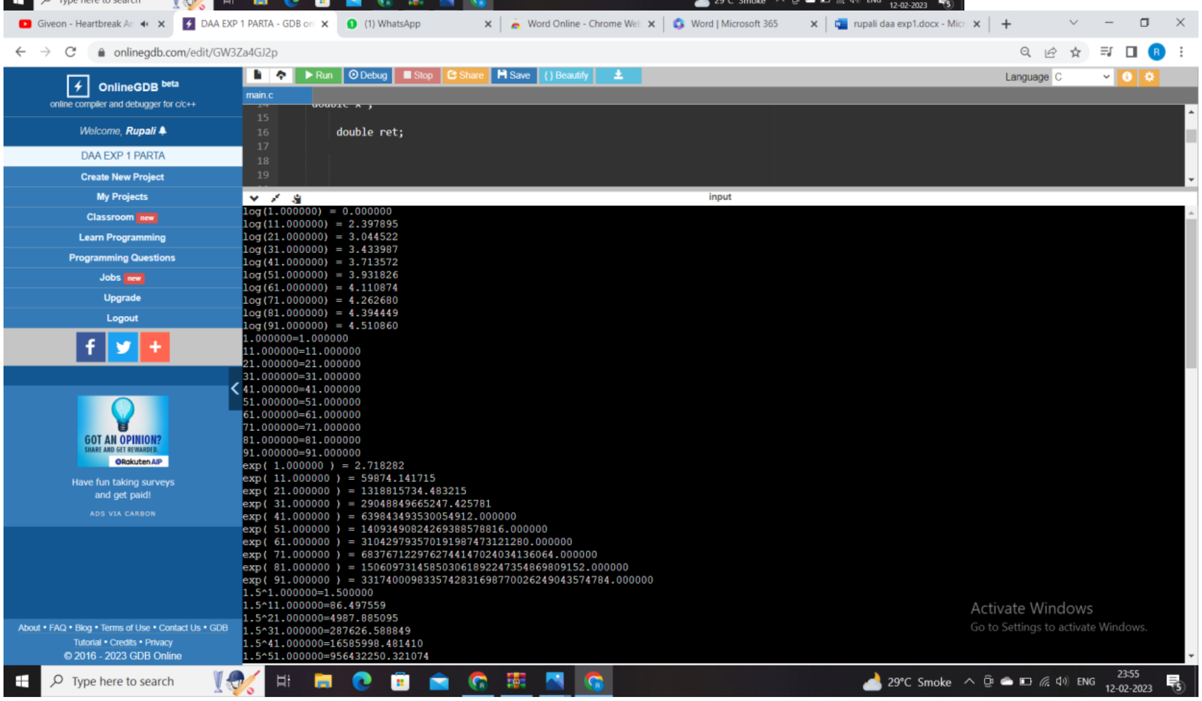
```
        #include <stdio.h>
#include <math.h>

int main(){

  double x ;

    double ret;



    for(x=1;x<=100;x+=10){ret = log(x);printf("log(%lf) = %lf\n", x,
ret);}        // log(x)
```

```
	for(x=1;x<=100;x+=10)printf("%lf=%lf\t\n", x,x);			// x

	for(x=1;x<=100;x+=10)printf("exp( %lf ) = %lf\n", x, exp(x));	//
e raise to x

	for(x=1;x<=100;x+=10)printf("1.5^%lf=%lf  \n",x, pow(1.5, x));	//
3/2 raise to x

	for(x=1;x<=100;x+=10)printf(" %lf^3=%lf\t\n", x, pow(x,3));		//
x raise to 3

	for(x=1;x<=100;x+=10)printf("2^%lf= %lf\t\n", x , pow(2,x));	//
2 raise to x

	for(x=1;x<=100;x+=10){ret = log(x);printf("%lf^1/2= %lf\t\n", ret,
sqrt(ret));}   // underroot of log(x)

	for(x=1;x<=100;x+=10){ret = log(x);printf("1.41 ^ %lf= %lf\t\n", x,
pow(1.41, ret));} // underroot of 2 raise to log(x)

	for(x=1;x<=100;x+=10){
	   double v= x*pow(2,x);
	   printf("%lf * %lf = %lf\t\n" , x , pow(2,x), v);

	}    // x *2^x

	for(x=1;x<=100;x+=10){
	double r = 2*pow(2,x);
	printf("2^%.2lf = %.2lf\n" ,pow(2,x) , r);	// 2 raise to 2 raise x
i.e(2^2^x)
	}



    return 0;
}
```

OUTPUT :



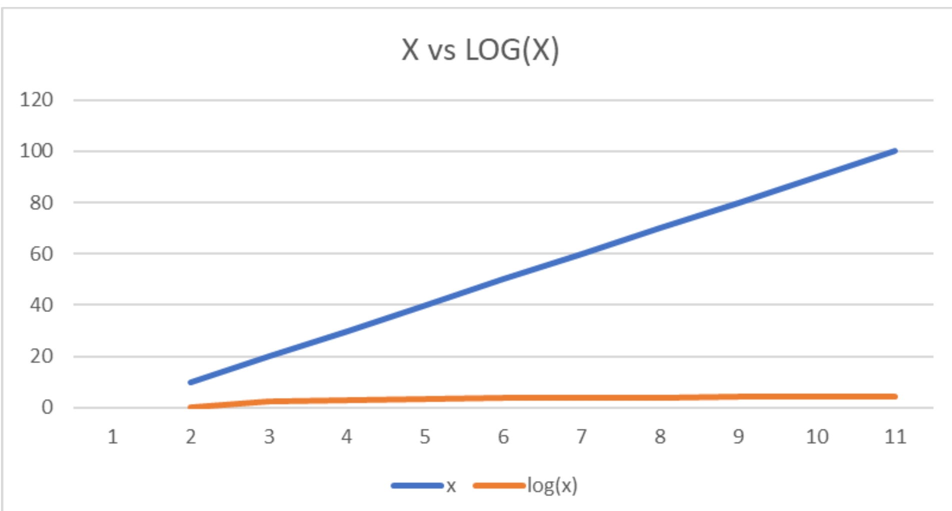
DAA EXP 1 PARTA
main.c
double ret;
3.931826^1/2= 1.982883
4.110874^1/2= 2.027529
4.262680^1/2= 2.064626
4.394449^1/2= 2.096294
4.510860^1/2= 2.123878
1.41 ^ 1.000000= 1.000000
1.41 ^ 11.000000= 2.279354
1.41 ^ 21.000000= 2.846433
1.41 ^ 31.000000= 3.253992
1.41 ^ 41.000000= 3.582085
1.41 ^ 51.000000= 3.861033
1.41 ^ 61.000000= 4.106019
1.41 ^ 71.000000= 4.325868
1.41 ^ 81.000000= 4.526222
1.41 ^ 91.000000= 4.710928
1.000000 * 2.000000 = 2.000000
11.000000 * 2048.000000 = 22528.000000
21.000000 * 2097152.000000 = 44040192.000000
31.000000 * 2147483648.000000 = 66571993088.000000
41.000000 * 2199023255552.000000 = 90159953477632.000000
51.000000 * 2251799813685248.000000 = 114841790497947648.000000
61.000000 * 2305843009213693952.000000 = 140656423562035331072.000000
71.000000 * 2361183241434822606848.000000 = 167644010141872405086208.000000
81.000000 * 2417851639229258349412352.000000 = 195845982777569926302400512.000000
91.000000 * 2475880078570760549798248448.000000 = 225305087149939210031640608768.000000
2^2.00 = 4.00
2^2048.00 = 4096.00
2^2097152.00 = 4194304.00
2^2147483648.00 = 4294967296.00
2^2199023255552.00 = 4398046511104.00
2^2251799813685248.00 = 4503599627370496.00
2^2305843009213693952.00 = 4611686018427387904.00
2^2361183241434822606848.00 = 4722366482869645213696.00
2^2417851639229258349412352.00 = 4835703278458516698824704.00
2^2475880078570760549798248448.00 = 4951760157141521099596496896.00



DAA EXP 1 PARTA
main.c
double ret;
log(1.000000) = 0.000000
log(11.000000) = 2.397895
log(21.000000) = 3.044522
log(31.000000) = 3.433987
log(41.000000) = 3.713572
log(51.000000) = 3.931826
log(61.000000) = 4.110874
log(71.000000) = 4.262680
log(81.000000) = 4.394449
log(91.000000) = 4.510860
1.000000=1.000000
11.000000=11.000000
21.000000=21.000000
31.000000=31.000000
41.000000=41.000000
51.000000=51.000000
61.000000=61.000000
71.000000=71.000000
81.000000=81.000000
91.000000=91.000000
exp(1.000000) = 2.718282
exp(11.000000) = 59874.141715
exp(21.000000) = 1318815734.483215
exp(31.000000) = 29048849665247.425781
exp(41.000000) = 639843493530054912.000000
exp(51.000000) = 14093490824269388578816.000000
exp(61.000000) = 310429793570191987473121280.000000
exp(71.000000) = 6837671229762744147024034136064.000000
exp(81.000000) = 150609731458503061892247354869809152.000000
exp(91.000000) = 3317400098335742831698770026249043574784.000000
1.5^1.000000=1.500000
1.5^11.000000=86.497559
1.5^21.000000=4987.885095
1.5^31.000000=287626.588849
1.5^41.000000=16585998.481410
1.5^51.000000=956432250.321074

FOLLOWING ARE THE GARHS :

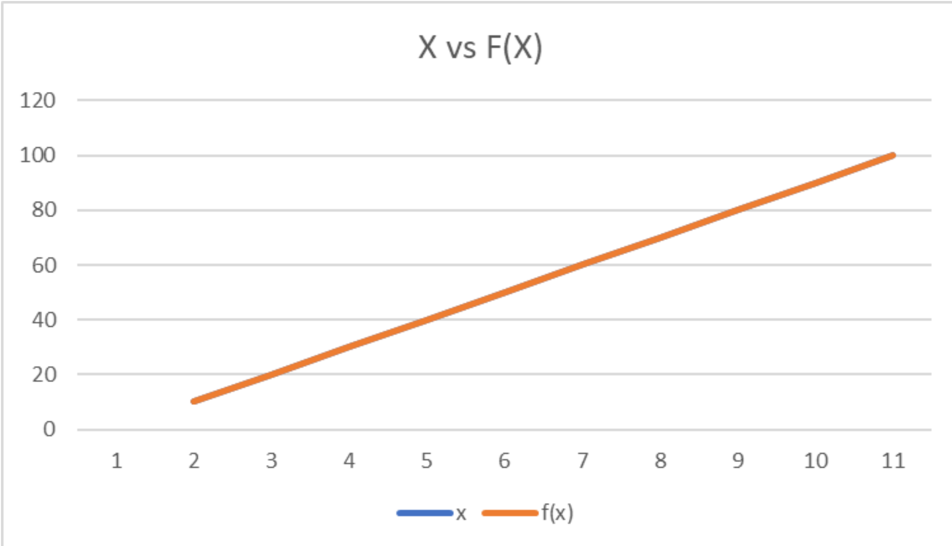
x	log(x)
10	0
20	2.397895
30	3.044522
40	3.433987
50	3.713572
60	3.931826
70	4.110874
80	4.26268
90	4.394449
100	4.51086



IN this we can observe while x is increasing gardually the log(x) is increasing linearly

2)

x	f(x)
10	10
20	20
30	30
40	40
50	50
60	60
70	70
80	80
90	90
100	100

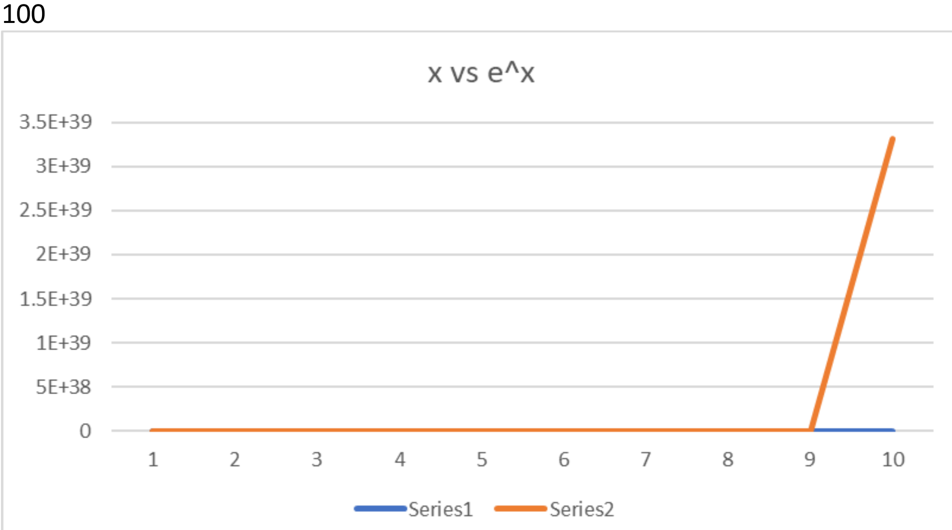


AS X Is increasing f(x) is increasing linearly hence x=f(x)

3)

x	e^x
10	2.718282
20	59874.14172
30	1318815734
40	2.90488E+13
50	6.39843E+17
60	1.40935E+22
70	3.1043E+26
80	6.83767E+30
90	1.5061E+35
	3.3174E+39

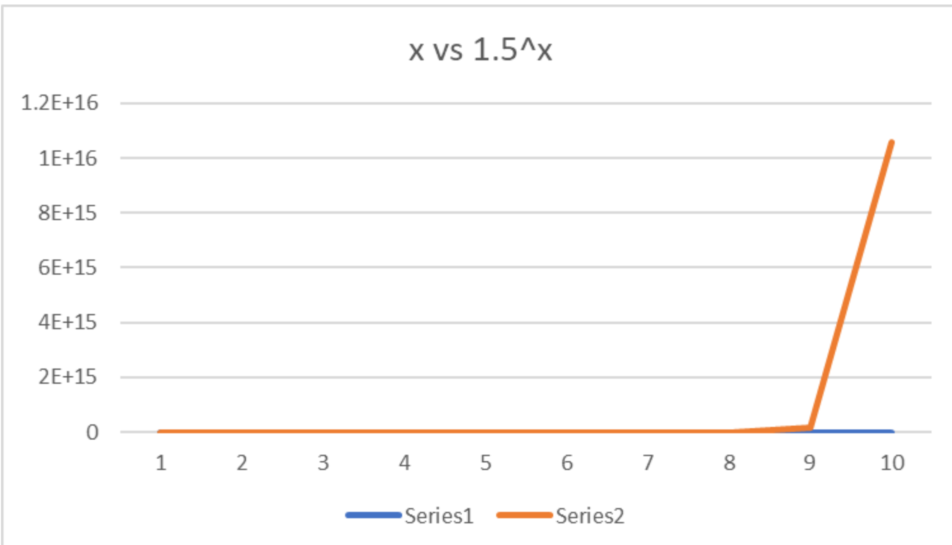
100



While x was increasing the e^x function remained constant for while and then showed sudden increment in slope .

4)

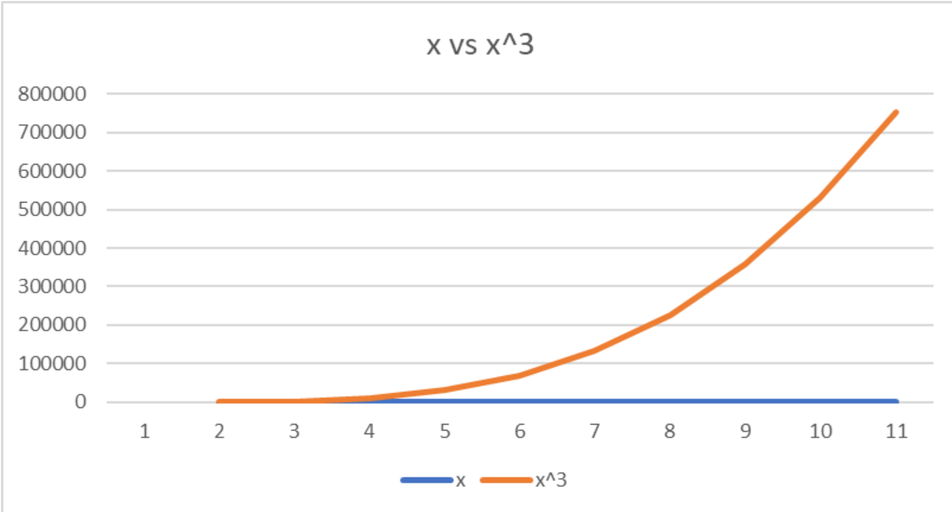
x	1.5^x
10	1.5
20	86.497559
30	4987.885095
40	287626.5888
50	16585998.48
60	956432250.3
70	55152703075
80	3.18038E+12
90	1.83397E+14
100	1.05756E+16



The x was increasing while 1.5^x remained constant after some values the x was increasing slowly while at that time the 1.5 ^x function showed sudden increment .

5)

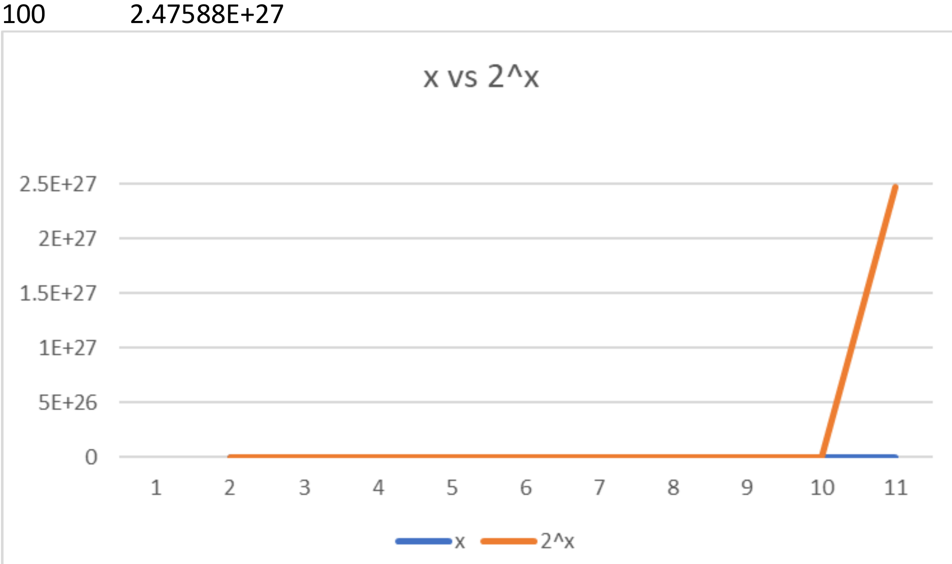
x	x^3
10	1
20	1331
30	9261
40	29791
50	68921
60	132651
70	226981
80	357911
90	531441
100	753571



While x was increasing the x^3 function started increasing exponentially .

6)

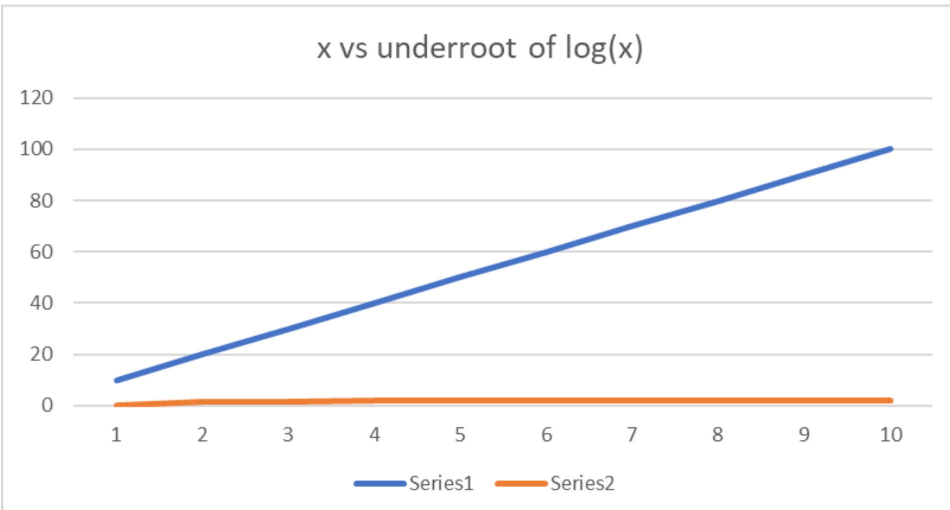
x	2^x
10	2
20	2048
30	2097152
40	2147483648
50	2.19902E+12
60	2.2518E+15
70	2.30584E+18
80	2.36118E+21
90	2.41785E+24
100	2.47588E+27



X was increasing while 2^x remained constant till end and at the end point the 2^x function'c curve increased suddenly.

7)

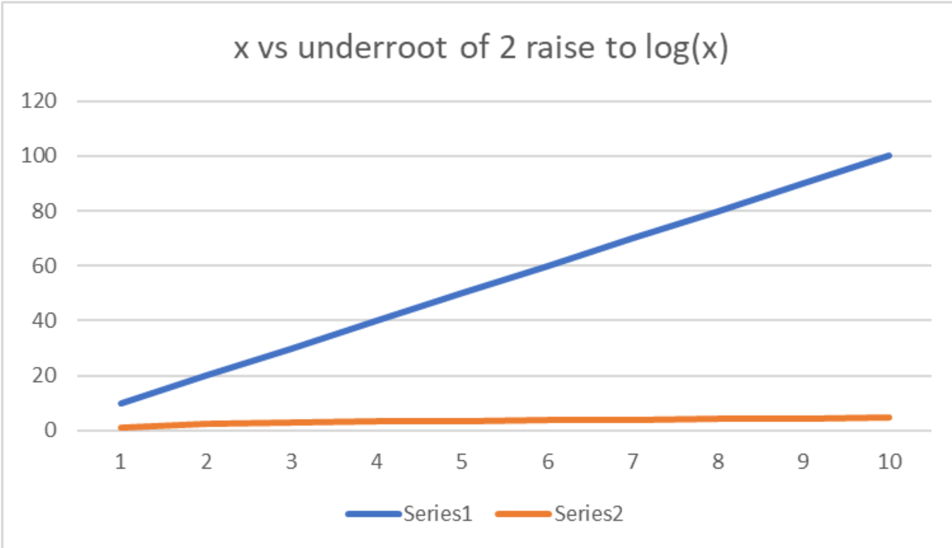
x	underroot of log(x)
10	0
20	1.548514
30	1.744856
40	1.853102
50	1.927063
60	1.982883
70	2.027529
80	2.064626
90	2.096294
100	2.123878



WHen x was increasing the y function was increasing linearly but the slope in start didn't touched x. axis

8)

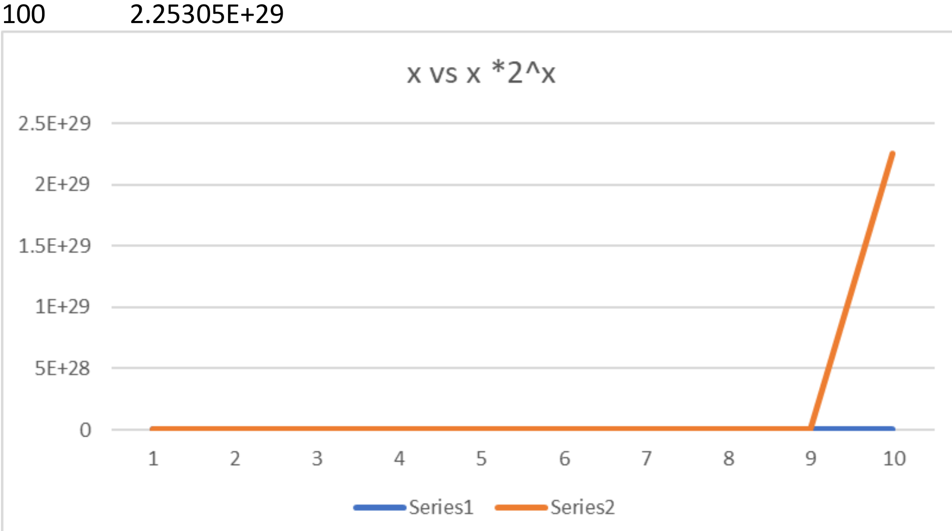
x	underroot of 2 raise to log(x)
10	1
20	2.279354
30	2.846433
40	3.253992
50	3.582085
60	3.861033
70	4.106019
80	4.325868
90	4.526222
100	4.710928



The graph of this funtion is exactly similar to above graph .

9)

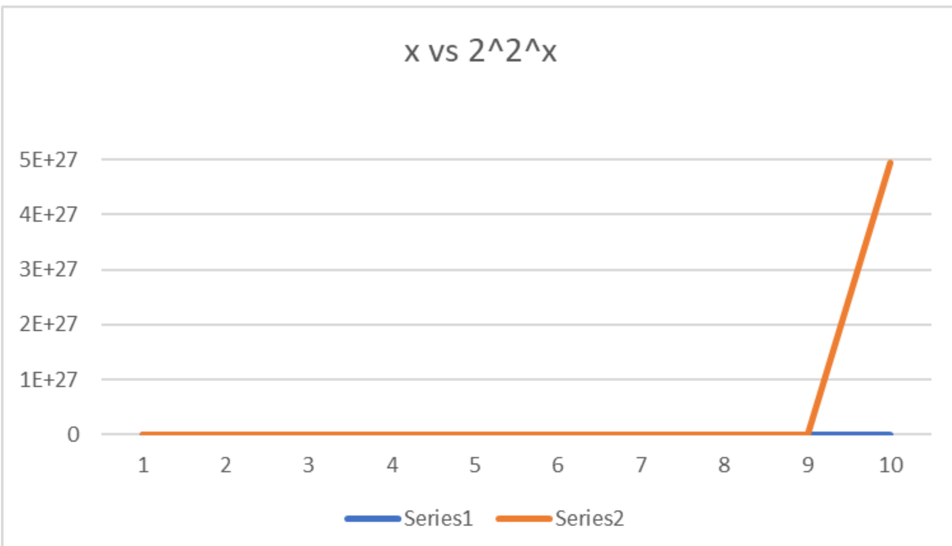
x	x *2^x
10	2
20	22528
30	44040192
40	66571993088
50	9.0916E+14
60	1.14842E+17
70	1.40656E+20
80	1.67644E+23
90	1.95846E+26
100	2.25305E+29



X was increasing while x*2^x remained constant till end and at the end point the 2^x function’c curve increased suddenly.

10)

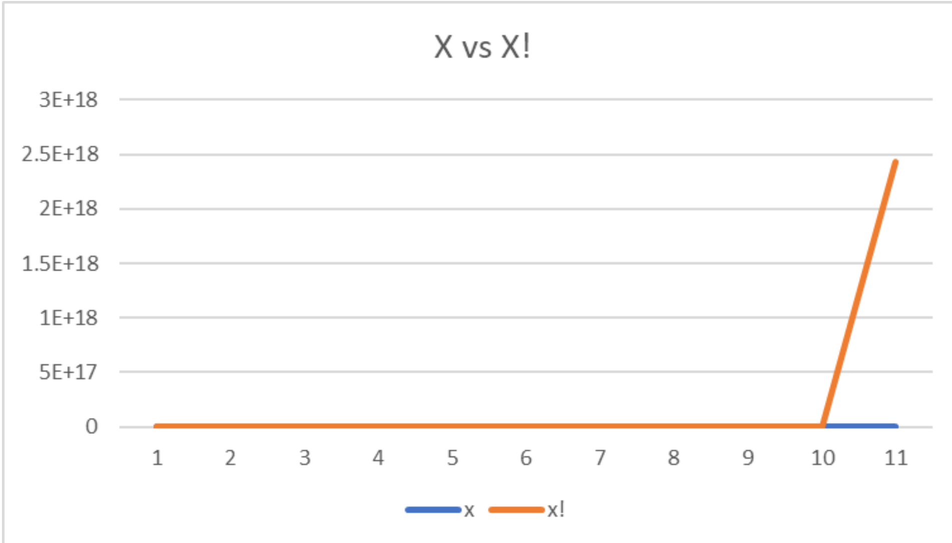
x	2^2^x
10	4
20	4096
30	4194304
40	4294967296
50	4.39805E+12
60	4.5036E+15
70	4.61169E+18
80	4.72237E+21
90	4.8357E+24
100	4.95176E+27



X was increasing while 2^2^x remained constant till end and at the end point the 2^x function’c curve increased suddenly.

11) n factorial

x	x!
0	1
2	2
4	24
6	720
8	40320
10	3628800
12	479001600
14	87178291200
16	2.09228E+13
18	6.40237E+15
20	2.4329E+18



X was increasing while x! remained constant till end and at the end point the 2^x function'c curve increased suddenly.

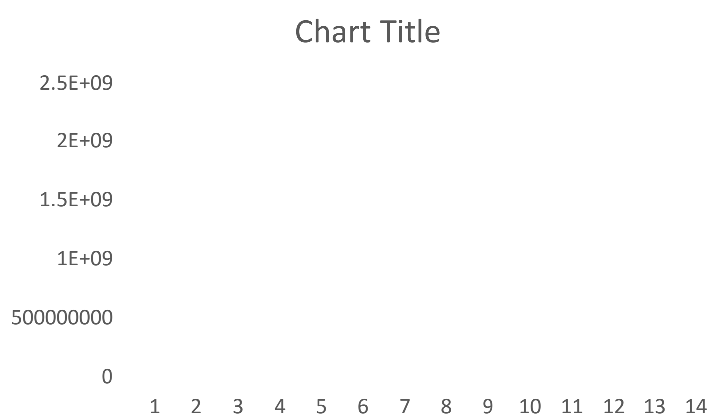
CONCLUSION : I learned about the 11 functions and their how they behave when ploted on t he graph (learned about the slopes of graphs)

OBSERVATION_(3) 2^(2^n): After n=8, the graph of this functions tends to infinity.

OBSERVATION_(4) ln(ln(n)): This function has a negative value at n=2. The graph has sudden increase at first but then gradually acquires a lesser slope.

OBSERVATION_(5) n*(2^n): This function has a sudden rise in value at n=92 after which it tends to infinity.

OBSERVATION_(10)



CONCLUSION:

From this experiment I learnt how to implement various functions in C Programming language for values of n varying from 0 to 100, and also understood how the graph of each function is affected as value of n changes.