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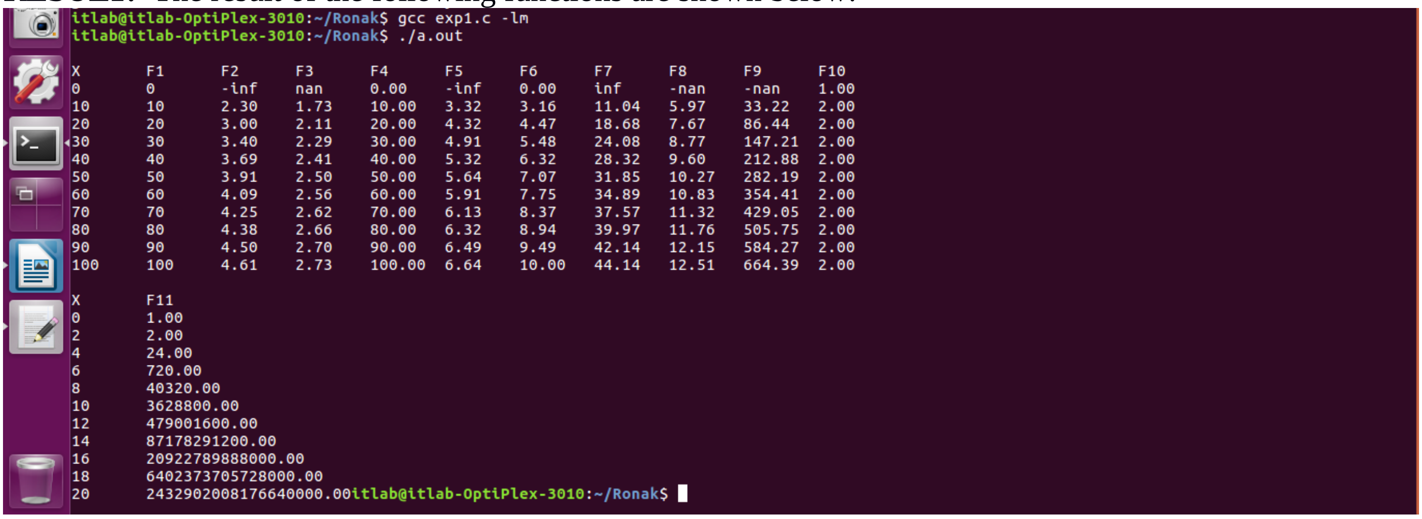
Experiment No.	1

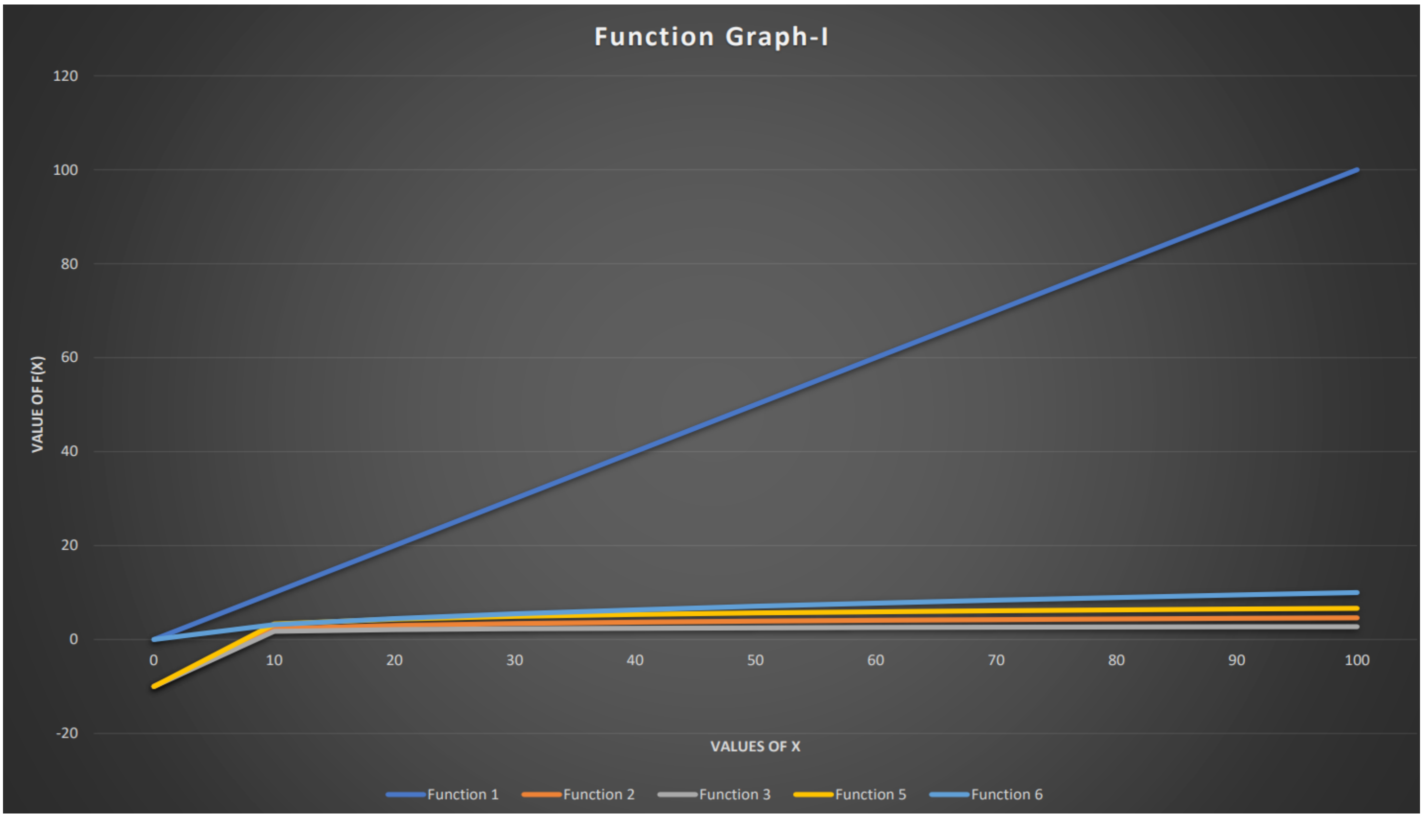
AIM:	1-A: To implement the various functions e.g. linear, non-linear, quadratic, exponential etc. 1-B: Experiment on finding the running time of an algorithm.
PART 1-A Program 1	
PROBLEM STATEMENT :	For this experiment, we have to implement at least 10 functions from the list. The input (i.e. n) to all the above functions varies from 0 to 100 with increment of 10. Then add the function n! in the list and execute the same for n from 0 to 20 with increment of 2.
ALGORITHM/ THEORY:	In this experiment part 1-A we must use 10 functions from the given list write a simple C code for it and then use the output from the code to draw a graph for the 10 functions + the factorial function and draw our conclusion regarding the functions.
PROGRAM:	(code below)

```c
#include<stdio.h>
#include<math.h>
double fact(int x){
     if(x==0)
       return 1;
     else
       return x*fact(x-1);
}
int f1(int x){
    return x;
}
double f2(int x){
    return log(x);
}
double f3(int x){
    return log2(log2(x));
}
double f4(int x){
    return pow(2,log2(x));
}
double f5(int x){
    return log2(x);
}
double f6(int x){
    return pow(sqrt(2),log2(x));
}
double f7(int x){
    return pow(log2(x),2);
}
double f8(int x){
    return pow(2,sqrt(2*log2(x)));
```

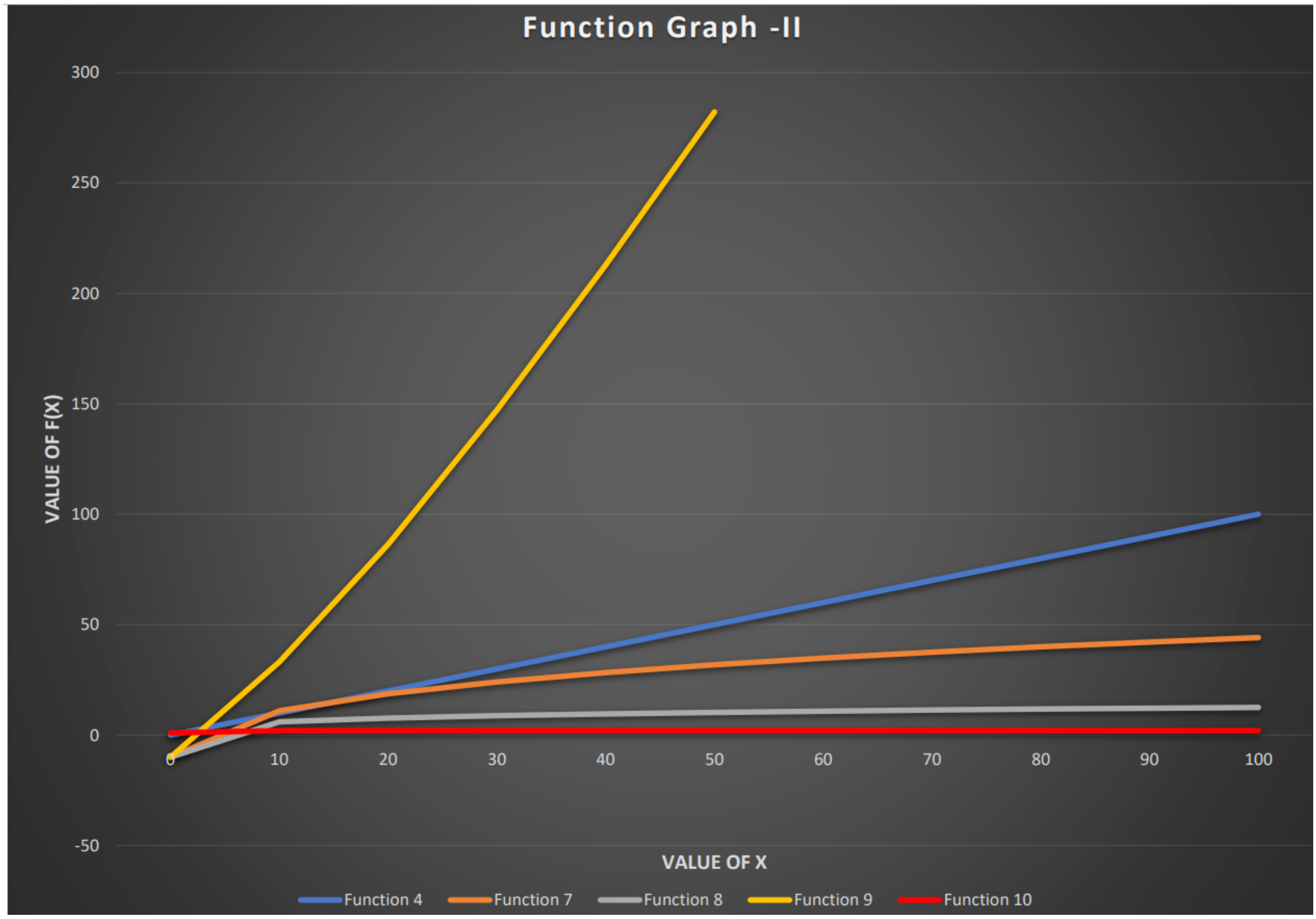
```c
}
double f9(int x){
    return x*log2(x);
}
double f10(int x){
    return pow(x,1.0/log2(x));
}
int main(){
    printf("\nX\tF1\tF2\tF3\tF4\tF5\tF6\tF7\tF8\tF9\tF10");
    for(int i=0;i<=100;i+=10){
        printf("\n%d\t",i);
        printf("%d\t",f1(i));
        printf("%.2lf\t",f2(i));
        printf("%.2lf\t",f3(i));
        printf("%.2lf\t",f4(i));
        printf("%.2lf\t",f5(i));
        printf("%0.2lf\t",f6(i));
        printf("%.2lf\t",f7(i));
        printf("%.2lf\t",f8(i));
        printf("%.2lf\t",f9(i));
        printf("%.2lf",f10(i));
    }
    printf("\n\nX\tFactorial Function");
    for(int i=0;i<=20;i+=2){
        printf("\n%d\t%.2lf",i,fact(i));
    }
}
```

RESULT: The result of the following functions are shown below:-

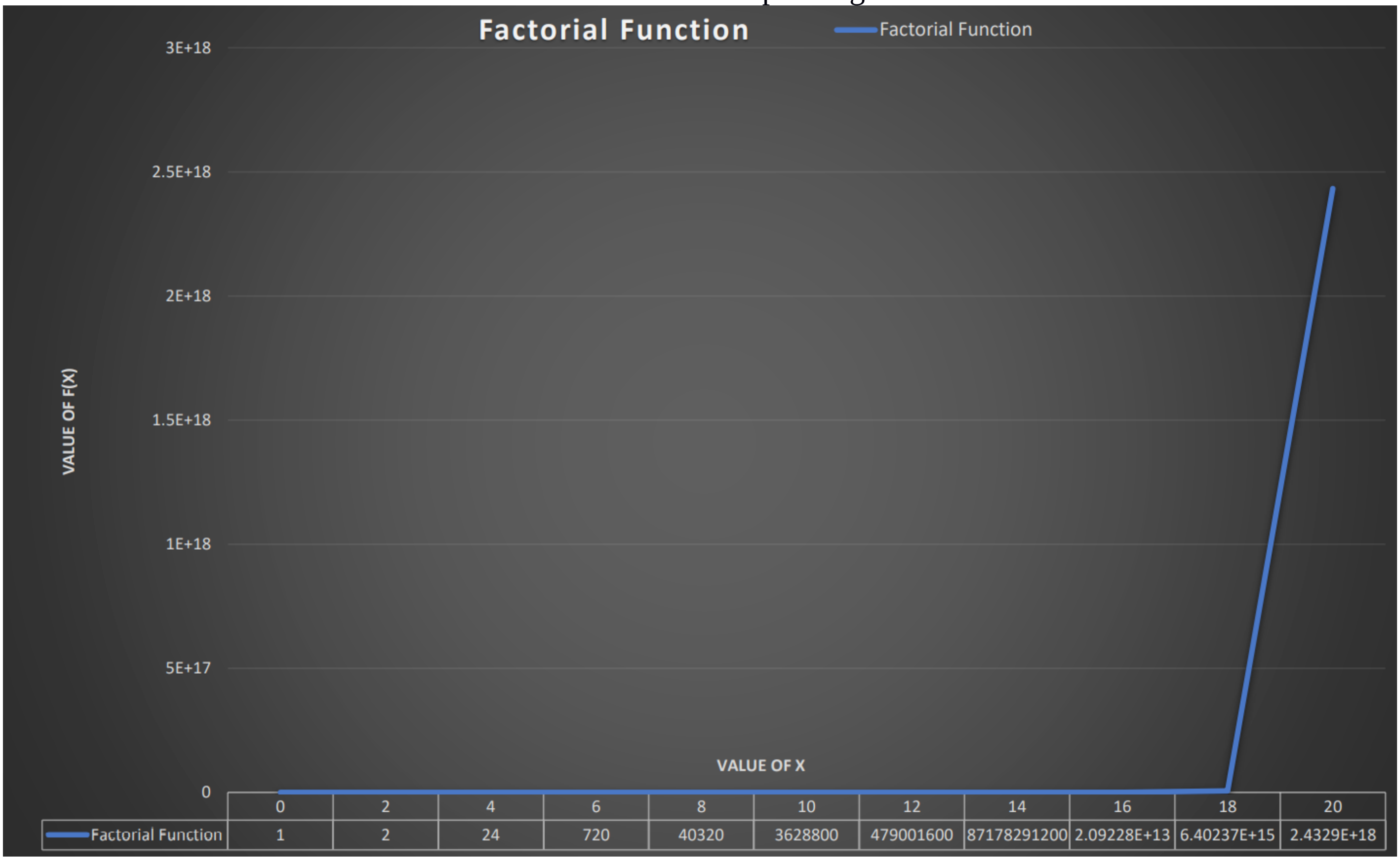

```
itlab@itlab-OptiPlex-3010:~/Ronak$ gcc exp1.c -lm
itlab@itlab-OptiPlex-3010:~/Ronak$ ./a.out

X       F1      F2      F3      F4      F5      F6      F7      F8      F9      F10
0       0       -inf    nan     0.00    -inf    0.00    inf     -nan    -nan    1.00
10      10      2.30    1.73    10.00   3.32    3.16    11.04   5.97    33.22   2.00
20      20      3.00    2.11    20.00   4.32    4.47    18.68   7.67    86.44   2.00
30      30      3.40    2.29    30.00   4.91    5.48    24.08   8.77    147.21  2.00
40      40      3.69    2.41    40.00   5.32    6.32    28.32   9.60    212.88  2.00
50      50      3.91    2.50    50.00   5.64    7.07    31.85   10.27   282.19  2.00
60      60      4.09    2.56    60.00   5.91    7.75    34.89   10.83   354.41  2.00
70      70      4.25    2.62    70.00   6.13    8.37    37.57   11.32   429.05  2.00
80      80      4.38    2.66    80.00   6.32    8.94    39.97   11.76   505.75  2.00
90      90      4.50    2.70    90.00   6.49    9.49    42.14   12.15   584.27  2.00
100     100     4.61    2.73    100.00  6.64    10.00   44.14   12.51   664.39  2.00

X       F11
0       1.00
2       2.00
4       24.00
6       720.00
8       40320.00
10      3628800.00
12      479001600.00
14      87178291200.00
16      20922789888000.00
18      6402373705728000.00
20      2432902008176640000.00itlab@itlab-OptiPlex-3010:~/Ronak$
```



From the above graph we observe that the Function 1 gives a linear graph that is y is proportional to x while the Functions 2,3,5 and 6 are increasing in a logarithmic manner. The increase of values in the Function 1 is constant and is greater than rest of the functions. The functions 2,3 and 5 produces an indeterminate value at x=0 which here is shown with the help of negative Y.



From the above graph we observe that Function 4 is directly proportional to x that is linearly increasing with x. The functions 7 and 8 are increasing in a logarithmic form. The function 9 is also increasing in a logarithmic manner but the value of F(x) for function 9 far exceeds the other functions. The function 10 gives a value 1 at x = 0 and then it is constant for the rest of the values of x. The functions 7,8 and 9 produces an indeterminate value at x=0 which here is shown with the help of negative Y.



In the above graph we can observe that the increase in the graph is in an irregular form and the graph will reach to an infinite values at some x.

CONCLUSION:	We observed the various functions and their graphs, the change in the values of the function with a slight change in the value of x were observed and are noted in the output.