DAA Experiment-1-A

(Batch-A/A1)

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Experiment Number	1-A

Aim:

To implement the various linear and non-linear functions.

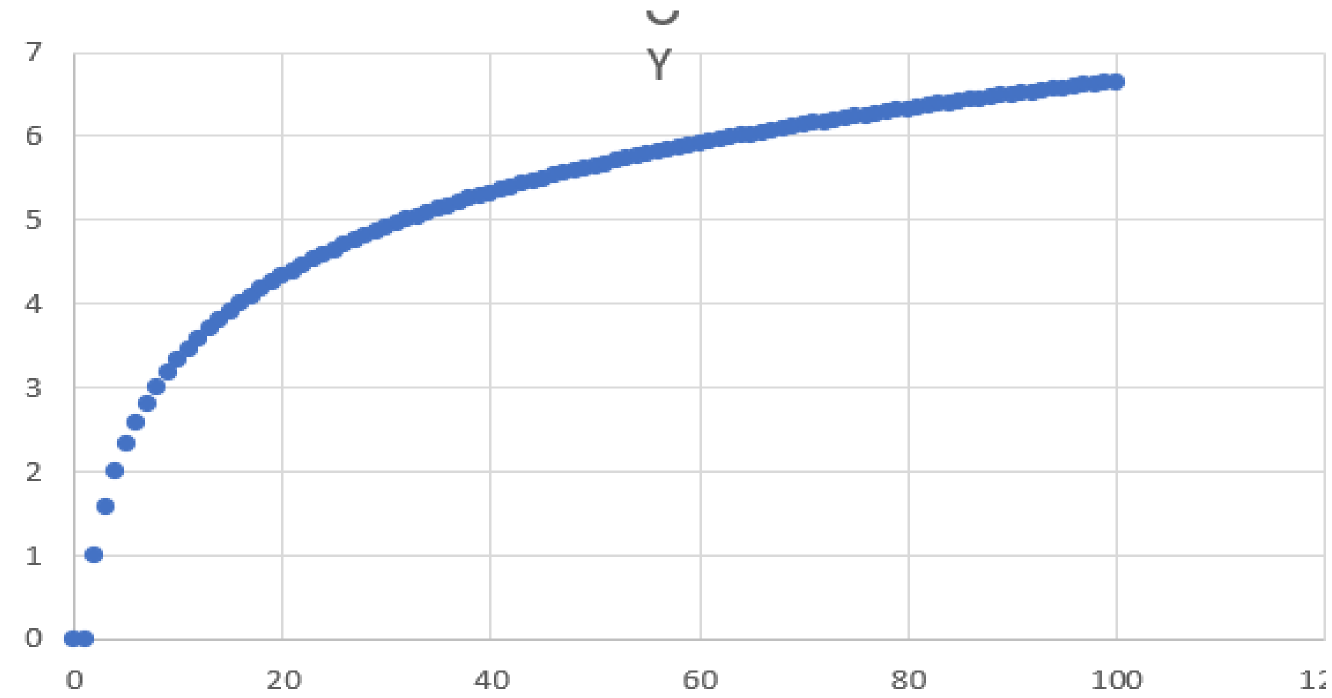
Program 1:

$\lg n$

```c

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%lf\n",n,log(n)/log(2));
    }
    return 0;
}
```



OBSERVATIONS:

This function is undefined at the input value of 0, the output at which is shown as 0 in the graph as per the default behaviour of the graph in an excel file. For very large values of x, we still get finite value of y since it is a logarithmic graph.

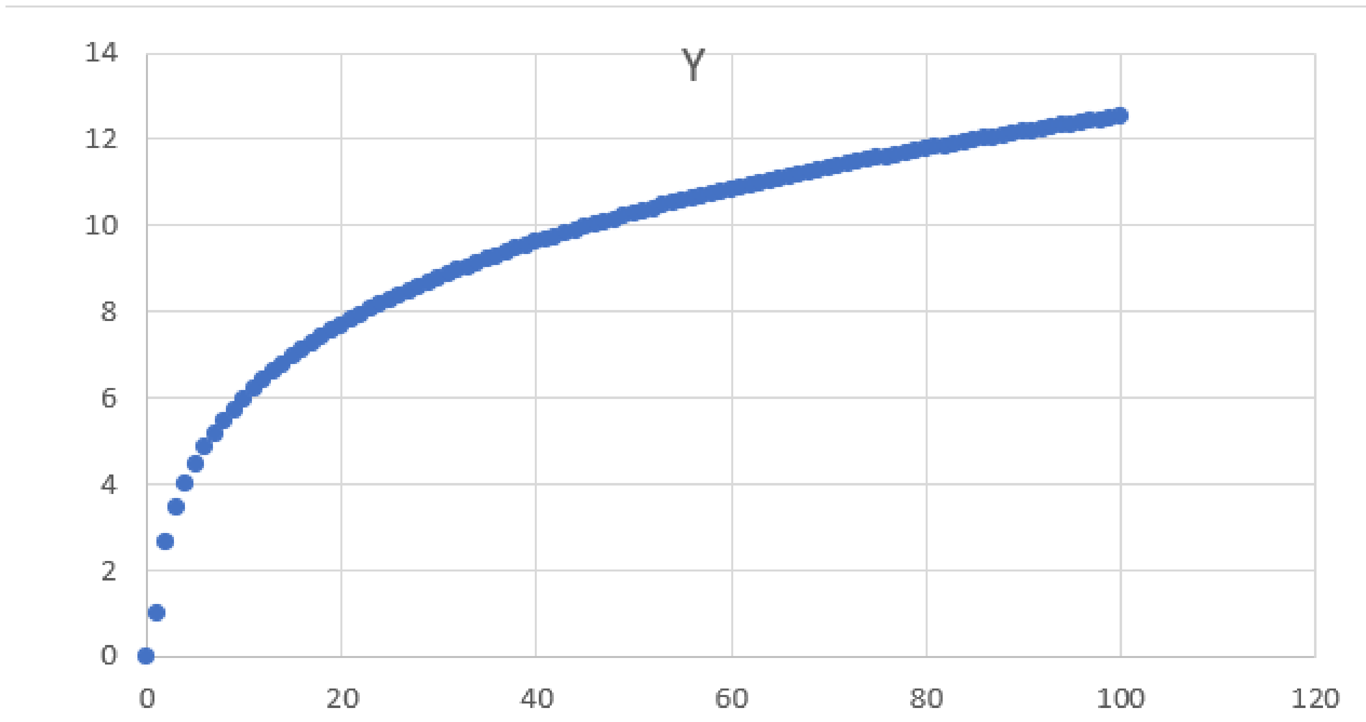
Program 2:

$$2^{\sqrt{2\lg n}}$$

```c

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%lf\n",n,pow(2,pow(2*(log(n)/log(2)),0.5)));
    }
    return 0;
}
```



<u>Observations</u>-

For very large values of x, the output y is still small which is very similar to logarithmic function.

Program 3:

n^3

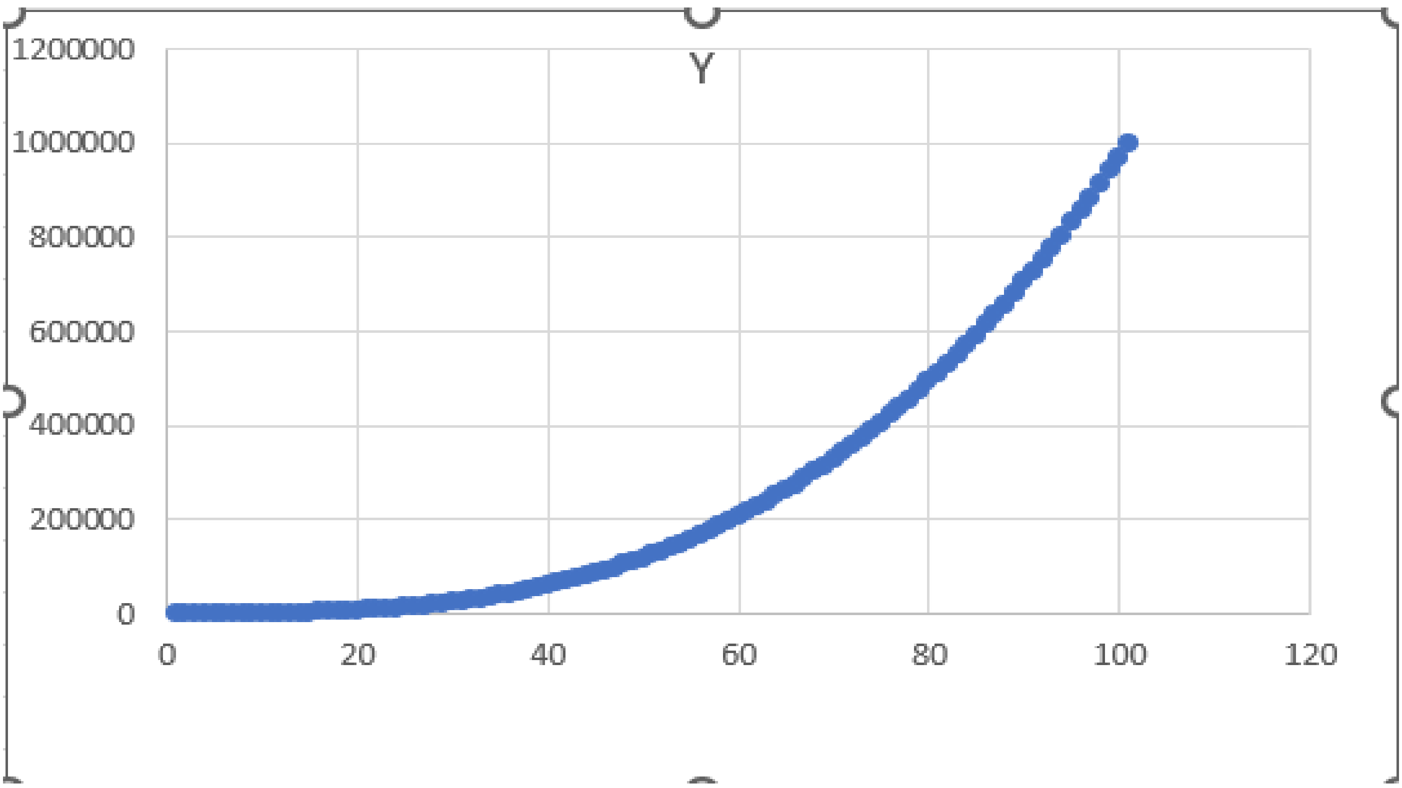
main.c

Run

```c

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%d\n",n,(n*n*n));
    }
    return 0;
}
```



OBSERVATIONS:

The graph of the function smoothly increases without any sudden rise or fall.

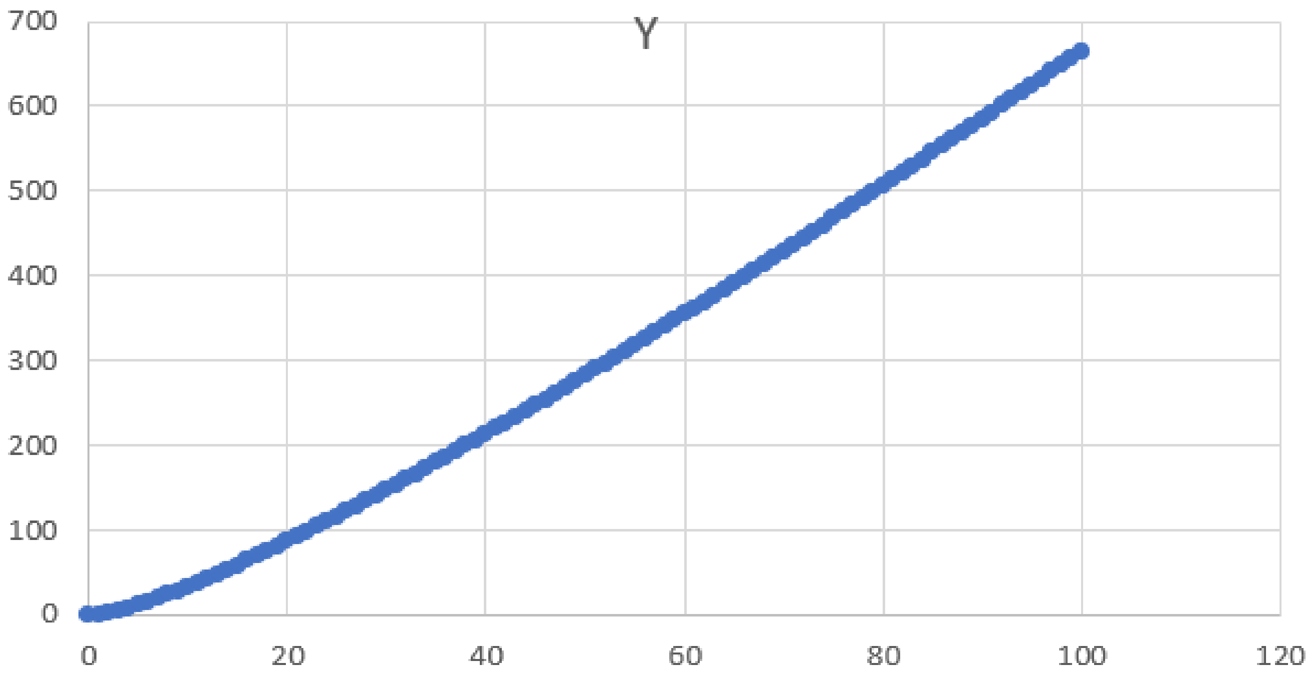
Program 4:

$n \lg n$

```c

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%lf\n",n,n*(log(n)/log(2)));
    }
    return 0;
}
```



OBSERVATIONS:

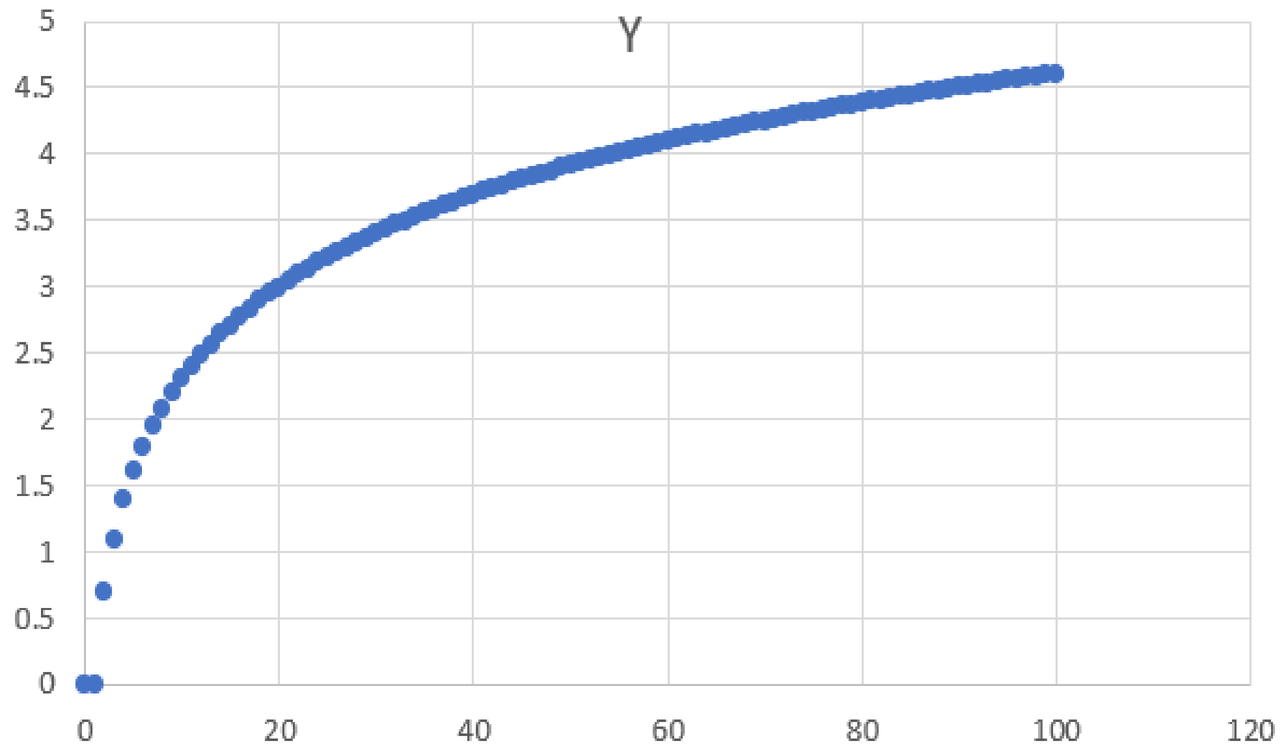
This graph increases as value of x increases in almost a linear manner .

Program 5:

$$\ln n$$

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%lf\n",n,log(n));
    }
    return 0;
}
```



OBSERVATIONS:

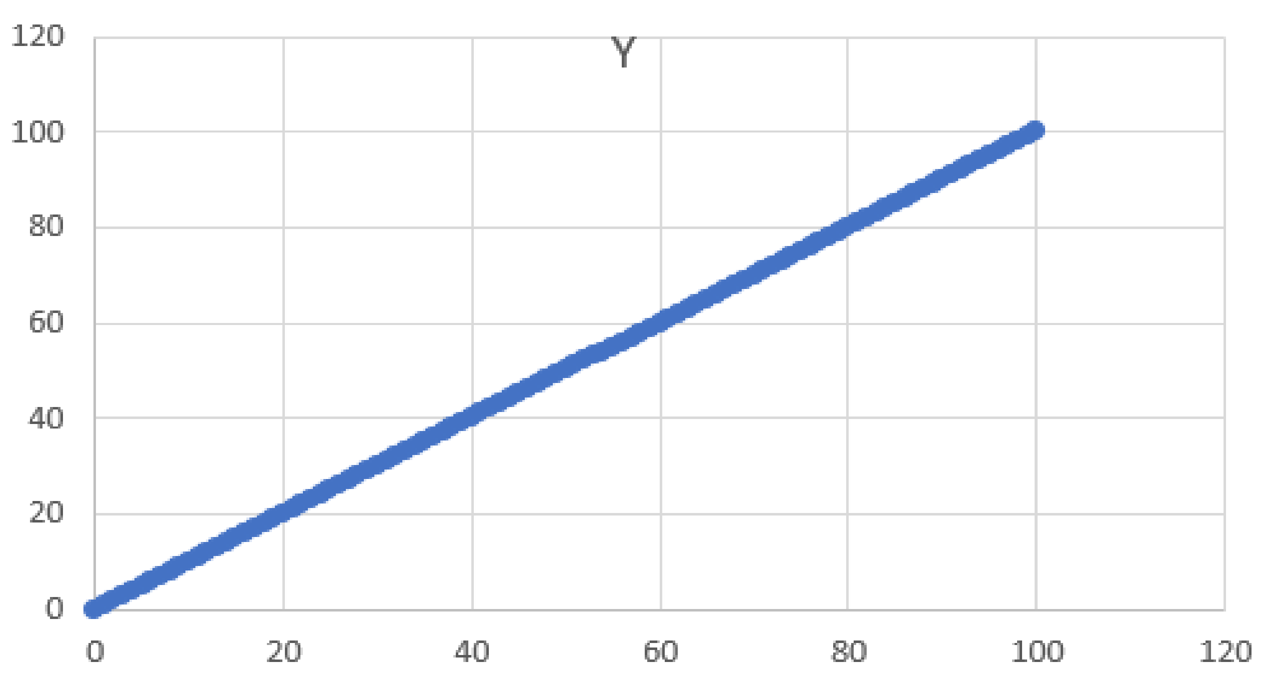
log(x) is defined for positive values of x. log(x) is not defined for real non positive values of x. the value of y almost becomes constant at very large values of x.

Program 6:

n

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%d\n",n,n);
    }
    return 0;
}
```



OBSERVATIONS:

A straight line is obtained as we are dealing with a linear function in this case.There are no input values for which the output is undefined.

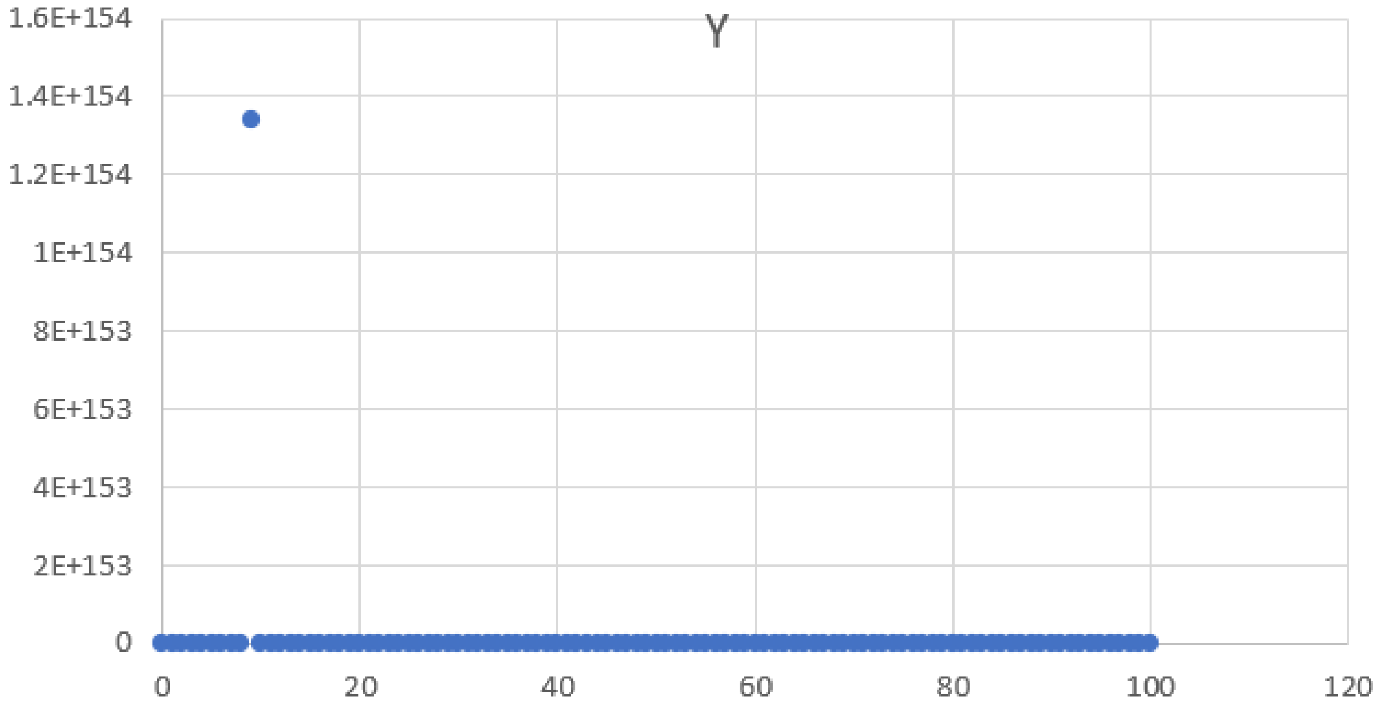
Program 7:

2^{2^n}

```

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%d\t%f\n",n,pow(2,pow(2,n)));
    }
    return 0;
}
```



OBSERVATIONS:

The above graph demonstrates that this function increases very rapidly even when the increment in the input is very less.

Program 8:

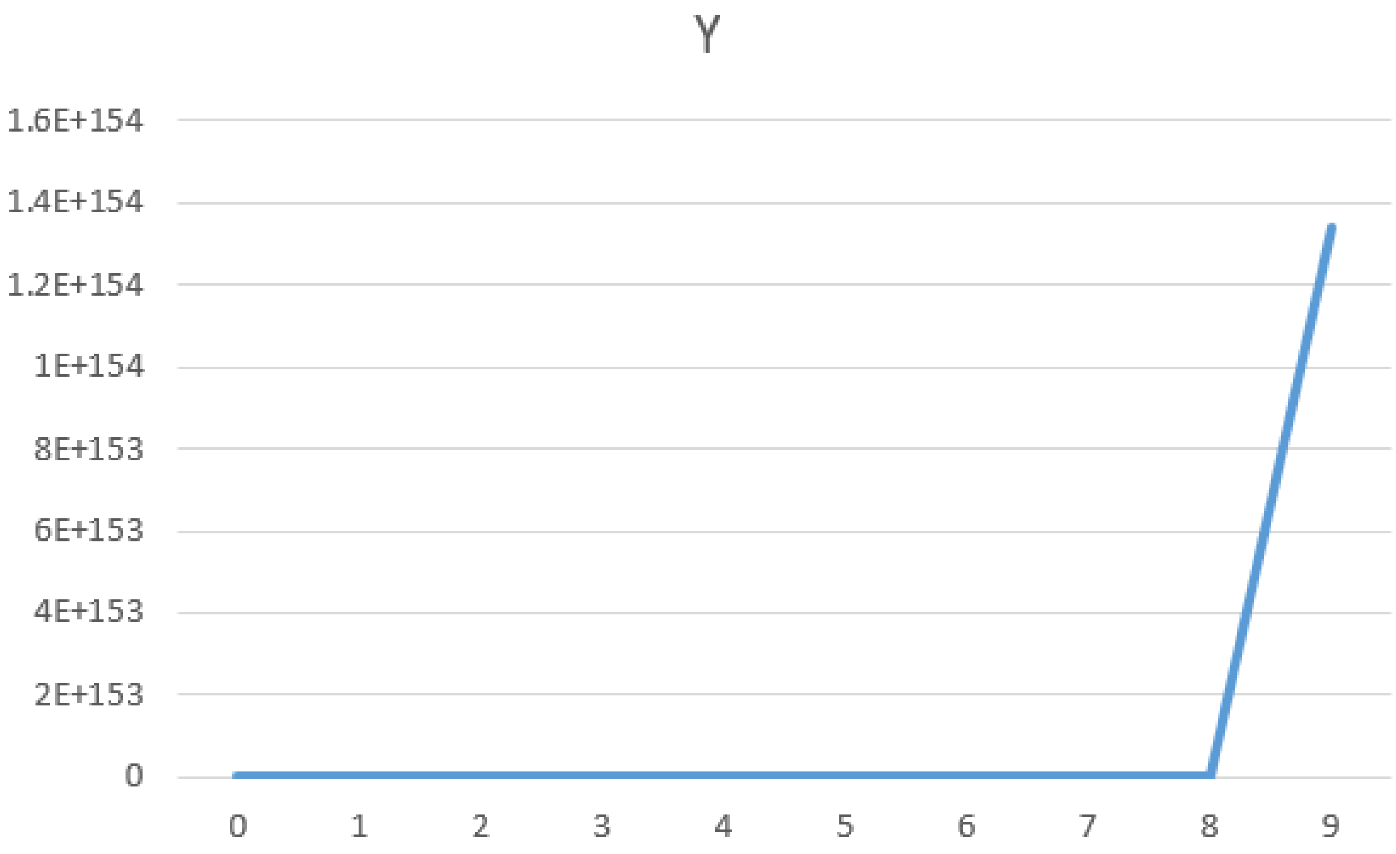
$n \cdot 2^n$

main.c

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

int main() {
    printf("X\tY\n");
    for(int n=0;n<101;n++){
        printf("%f\t%f\n",n,(n*pow(2,n)));
    }

    return 0;
}
```



OBSERVATIONS:

This graph is similar to that of a generic exponential function and this function is undefined at the input value of 0, the output at which is shown as 0 in the graph as per the default behaviour.

Program 9:

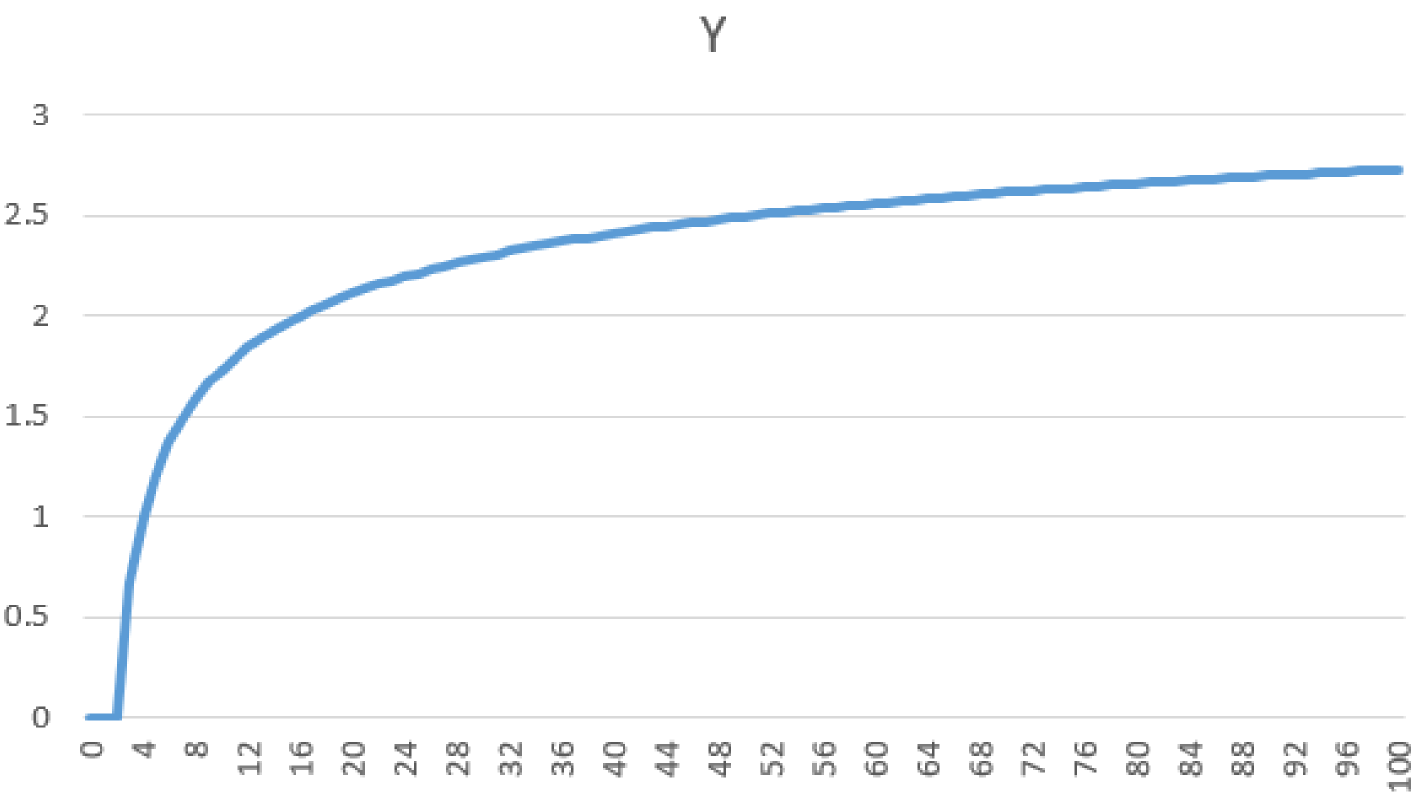
$$\lg \ (\lg n)$$

main.c

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

int main() {
    printf("Y\tX\n");
    for(int n=0;n<101;n++){
        printf("%.1f\t%.1f\n",n,log(log(x)/log(2))/log(2));
    }

    return 0;
}
```



OBSERVATIONS:

This is undefined for the input values 0 and 1, the output of which are shown as zero in the graph as per the default behaviour. First the graph increases rapid and then slow.

Program 10:

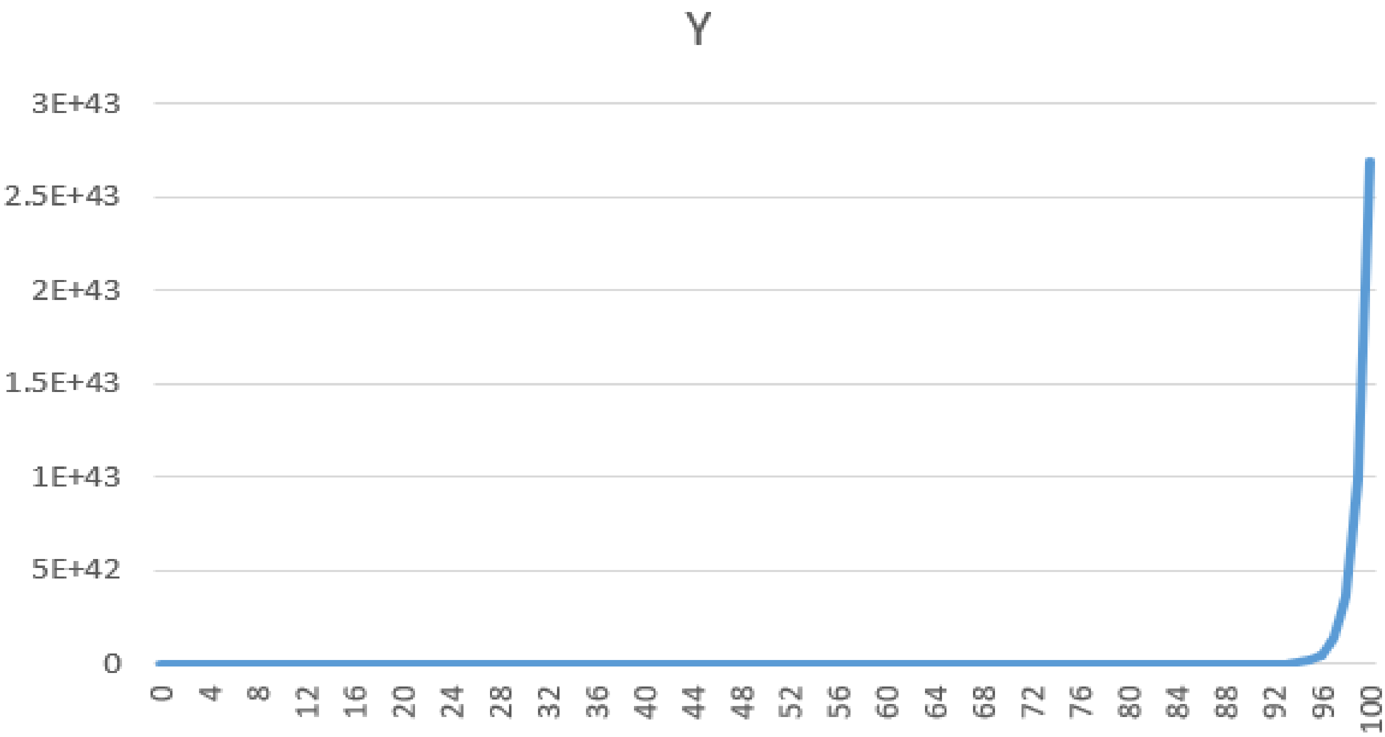
e^n

main.c

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

int main() {
    printf("Y\tX\n");
    for(int n=0;n<101;n++){
        printf("%.1f\t%.1f\n",n,exp(n));
    }

    return 0;
}
```



OBSERVATIONS:

A flat line is observed which rises around the input value of 95 and this shift of output demonstrates the nature of an exponential function.

Conclusion:

With the help of this experiment, I was able to understand the various functions and their nature. I also learned how to use Excel to plot graphs with the data available.