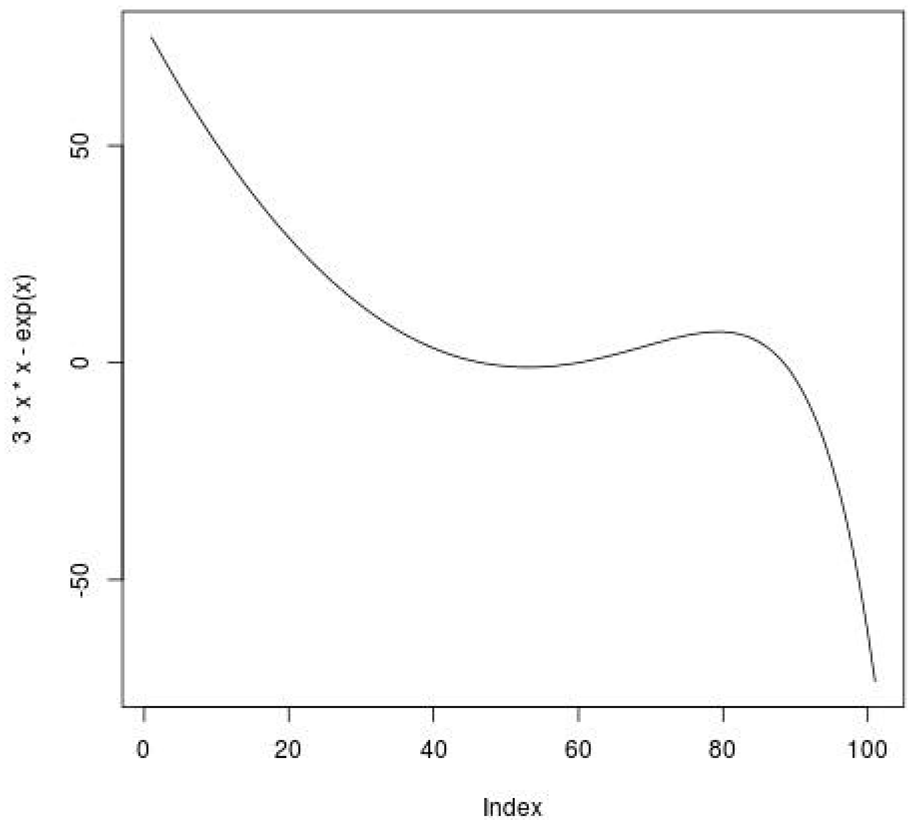
LAB REPORT



Start of C++ Code

```
#include <iostream>

#include <cmath>

#include <cstdio>


#define E 2.71828


using namespace std;

//this gives the value of given function
long double function_value(long double x){
```

```
    long double y;

    y = (3*x*x) - pow(E, x);

    return y;

}


//this gives the value of derivative
long double derivative_value(long double x){

    long double y;

    y = (6*x) - pow(E, x);

    return y;

}


//this function implements Newton-Raphson method
void func(long double x){

    long double val_func, val_der, next_val;

    long double prec = 0.00001;



    cout.precision(15);



    val_func = function_value(x);

    val_der = derivative_value(x);



    next_val = x - (val_func/val_der);


    //checking if value is in the specified precision
    if(abs(x-next_val)<prec){

        cout<<x<<endl;

    }

    else{

        func(next_val);
```

```
    }
}

int main(){
    long double x;

    //calling the function to get 3 roots
    cout<<"The 3 roots of given function are:\n";
    func(0.0);
    func(2.0);
    func(4.0);

    return 0;
}
```

End of C++ code

Start of R code

```
func<-function(x){
	prec<-0.00001;
	func_val<-((3*x*x) - (2.71828^x));
	deri_val<-((6*x) - (2.71828^x));

	next_val<-(x-(func_val/deri_val));

	if(abs(x-next_val)<prec){
		return(x);
	}
	else{
		func(next_val);
	}
}

main<-function(){
	val<-c(func(0),func(2),func(4));
	return(val);
}
```

End of R-code

RESULT

Roots which I got through R package are: 0.910071, -0.4589623 and 3.7330893
Roots which I got through C++ program are: -0.4589623, 0.9100070 and 3.7330893
The actual roots of the equation 3*x*x - e^x are: 0.91008, -0.458962 and 3.73308
This shows I have got the roots within the precision limit of 10^-5.

INTERPRETATION

The Newton-Raphson method is an iterative process for solving the root of the equation
f (x) = 0. According to the method, starting with an initial guess of x_0 , apply the iterative formula

$$x_{n+1} = x_n - (f(x_n)/f'(x_n))$$

where f denotes the derivative of the function. The iteration stops until you arrive
at an acceptable limit $|x_{n+1} - x_n| < \varrho$, where ϱ is some pre-specified tolerance value.

On plotting the graph of this, the 3 roots are found in the intervals (-1,0), (0,1) and (3,4).
The Newton-Raphson method gave 3 roots within the error limit of 10^-5.
This method is a very good approximate method for finding the roots of an equation within a precision limit.