

# Report of Assignment 1

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Results:

Number of Intervals	Trapezoidal Rule Result	Error	Convergence Order	Simpson Rule Result	Error	Convergence Order
N=20	1.99588597	0.00645964	2.00000000	2.00000678	0.00001063	4.00953176
N=40	1.99897181	0.00161491	1.99999107	2.00000042	0.00000066	4.04439412
N=80	1.99974297	0.00040373	2.00003573	2.00000003	0.00000004	
N=160	1.99993574	0.00010093	2.00014295	2.00000000	0.00000000	
N=320	1.99998394	0.00002523		2.00000000	0.00000000	

PS: Codes as follows:

## 1. Trapezoidal Rule:

```
// stdafx.cpp : source file that includes just the standard includes
// Trapezoidal Rule.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

#include "stdafx.h"

// TODO: reference any additional headers you need in STDAFX.H
// and not in this file

// Trapezoidal Rule.cpp : Defines the entry point for the console application.
//

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

double f(double x)
{
    return (sin(x));
}
double g(double x)
{
    return (-sin(x));
}
```

```

}
int main()
{
    double a = 0.0;
    double b =acos(-1);
    int N = 20;
    double h = (b - a) / N;
    double s = 0.5*h*(f(a) + f(b));
    for (int i = 1; i < N; i++)
    {
        s = s + h*f(a + i*h);
    }
    double E = (b - a)*h*h / 12;
    printf("integration of sin(x), from 0 to PI, with Trapezoidal Rule is: %0.8f\n",
s);
    printf("error bound in Trapezoidal Rule is: %0.8f\n", E);
    return 0;
}

```

## 2. Simpson Rule:

```

// stdafx.cpp : source file that includes just the standard includes
// Simpson Rule.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

```

```

#include "stdafx.h"

```

```

// TODO: reference any additional headers you need in STDAFX.H
// and not in this file

```

```

// Simpson Rule.cpp : Defines the entry point for the console application.
//

```

```

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

```

```

double f(double x)
{
    return (sin(x));
}

```

```

double h(double x)

```

```

{
    return (sin(x));
}

int main()
{
    double a = 0.0;
    double b = acos(-1);
    int N = 320;
    double h = (b - a) / N;
    double s = f(a) + f(b);
    for (int i = 1; i < N; i++)
    {
        if (i % 2 != 0)
            s = s + 4 * f(a + i*h);
        else s = s + 2 * f(a + i*h);
    }
    s = h*s / 3;
    double E = (b - a)*h*h*h*h / 180;
    printf("integration of sin(x), from 0 to PI, with Simpson Rule is: %0.8f\n",
s);
    printf("error bound in Simpson Rule is: %0.8f\n", E);
    return 0;
}

```