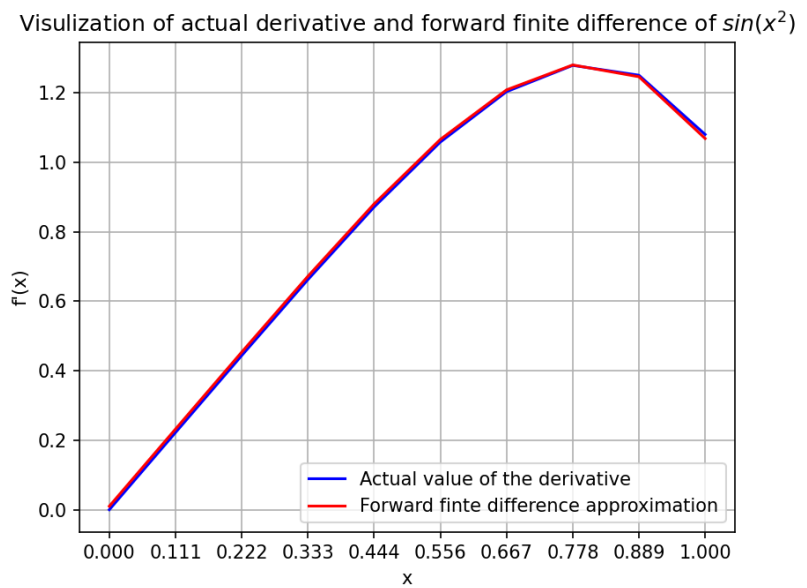# Computational Methods & Applications

Coding Assignment-4
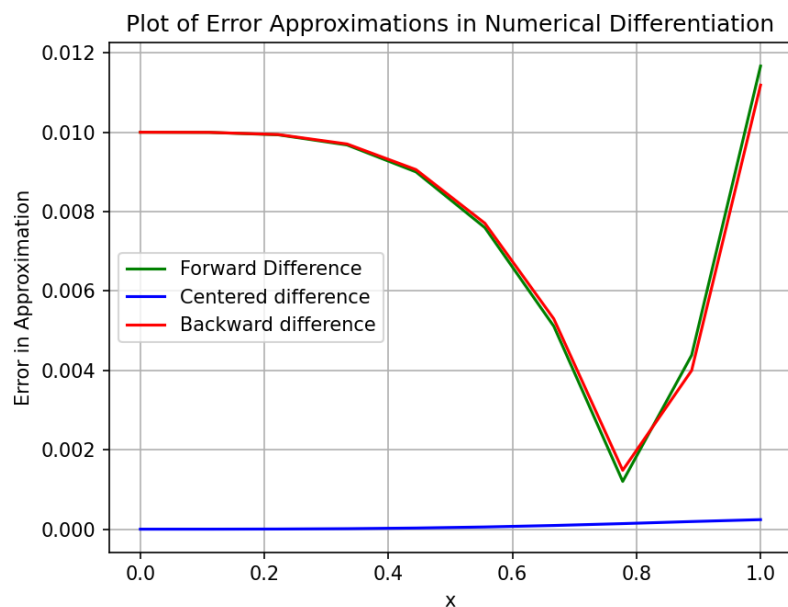
Topic – Numerical Differentiation and Integration.

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Q.1) Output:-

Visulization of actual derivative and forward finite difference of $sin(x^2)$

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Q.2)Output:-

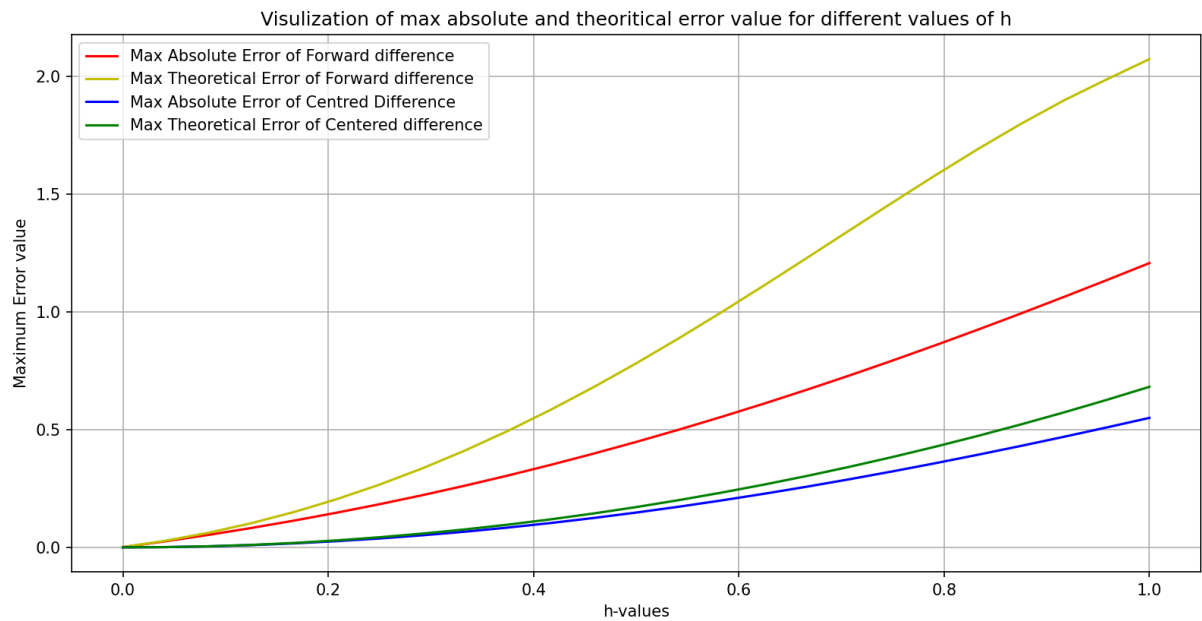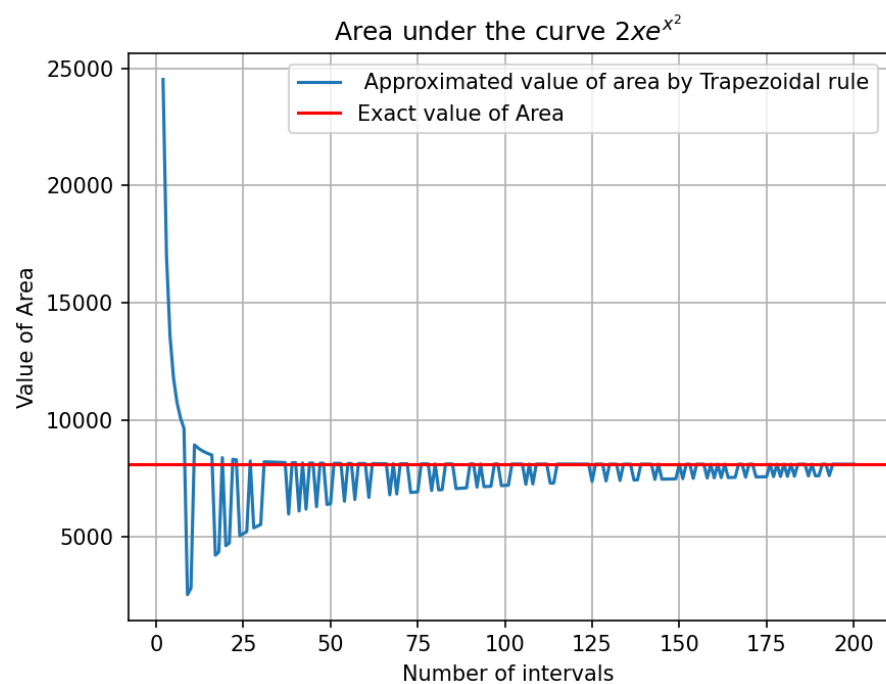Plot of Error Approximations in Numerical Differentiation

Observation :

From above figure we can see that , **Centered Finite Difference** is better approximation of derivative than Forward and Backward finite difference.

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Q.3)Output:

Visulization of max absolute and theoritical error value for different values of h

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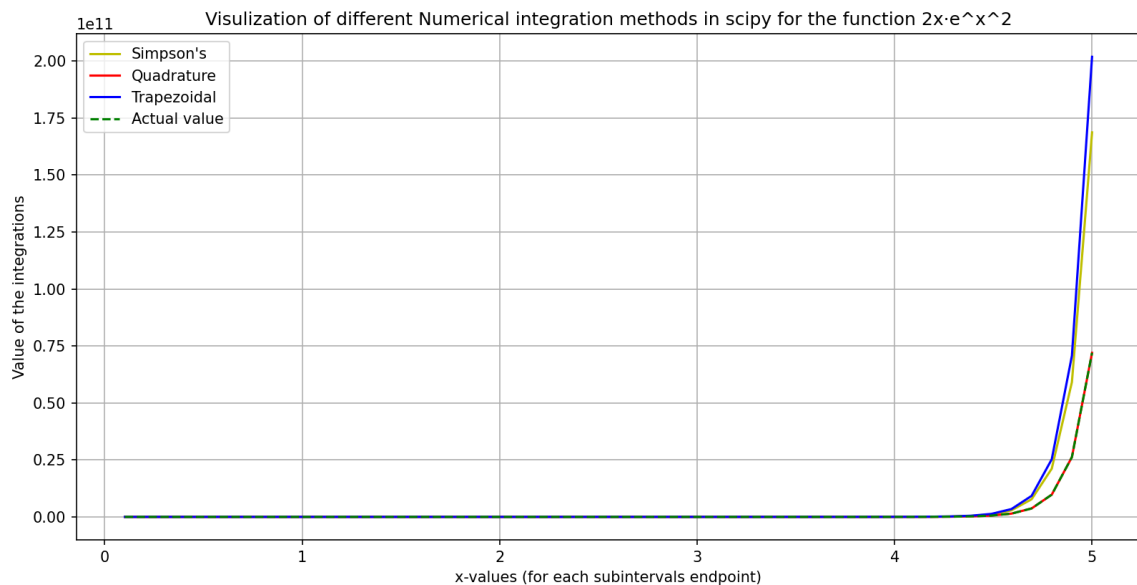
Q.4)Output:

Area under the curve $2xe^{x^2}$

Observation : From above pic ,We can conclude that increasing the number of sub-interval of [a,b], we get better approximation of integration by Trapezoidal rule.

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Q.5) Output:

Observation: From the above pic, we conclude that 'quadrature' method of numerical integration gives the better approximation than others.

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Q.6)

```
p = Polynomial([1, 2, 3])
pd = p.derivative()
print(pd)
print(p.area(1,2))
```

Output:

```
Coefficients of the polynomial are:
 2 6
Area in the interval [1, 2] is: 11.0
```

....

Q.7) Output:-

```
The approximated area is:  0.17177502290702162
The approximation error is 0.22344451869978582
```

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