

**ANALYZING ACCURACY: A COMPARATIVE STUDY OF
TRAPEZOIDAL RULES, SIMPSON'S RULES, WEDDLE'S
RULES, AND MIDPOINT RULES**

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ABSTRACT

The moment it is impossible to determine a closed form of the integral or when an approximate value only of the definite integral is required, researchers can utilize numerical integration to estimate its values. The Midpoint rule, Trapezoidal rule, Simpson's rule, and Weddle's rule are the methods for numerical integration that are most frequently utilized. The question of which of the five methods is the best yields a more precise response. By using the same subintervals, find the error of all methods. This project tries to investigate and analyze the behaviour of each numerical method. Calculate an approximate value for the area under the curve and calculate the error to determine which one chosen numerical integration methods is the best. The methods are: Trapezoidal rule, Simpson's rule, Weddle rule, and Midpoint rule. As a result, it is possible to conclude that Weddle's Rule with a subinterval of $n=96$ is the most effective method based on the error. Simpson's 3/8 Rule is the best approach based on CPU Times; the best subinterval based on CPU Times is $n=12$ but the worst subinterval is $n=96$. It demonstrated that Weddle's Rule is the most effective numerical strategy for resolving challenging integration issues. It is advised to attempt more challenging integration issues based on various intervals and subintervals. Researchers could also introduce more numerical integration methods.

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