5.3 Romberg Integration

To improve the accuracy of the Trapezoidal Rule, Series can be shown that the error of the Trapezoidal Rule (p. 212) may cancel, so that the error of each of the Trapezoidal Rules can be made smaller. To improve the accuracy of the Trapezoidal Rule, Series may be used to show that the error of the Trapezoidal Rule may cancel. The Series can be found by applying the Trapezoidal Rule to the function evaluated at the midpoint of the interval [a, b].

The results of applying the Trapezoidal Rule to the function evaluated at the midpoint of the interval [a, b] can be used to improve the accuracy of the Trapezoidal Rule. The results of applying the Trapezoidal Rule to the function evaluated at the midpoint of the interval [a, b] can be used to improve the accuracy of the Trapezoidal Rule. The results of applying the Trapezoidal Rule to the function evaluated at the midpoint of the interval [a, b] can be used to improve the accuracy of the Trapezoidal Rule.

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5.5 Gaussian Quadrature

The Gaussian quadrature is a powerful method for calculating definite integrals. It is particularly useful when integrating over multidimensional spaces that have multiple variables. The Gaussian quadrature is based on the idea of approximating the integral by a weighted sum of function values at specific points, known as nodes, which are chosen to minimize the error of the approximation.

The Gaussian quadrature can be used to approximate the integral of a function over a given interval. The nodes and weights for the quadrature are determined by the type of Gaussian quadrature used. For example, the Gauss-Legendre quadrature uses the Legendre polynomials to determine the nodes and weights, while the Gauss-Hermite quadrature uses the Hermite polynomials.

The Gaussian quadrature is a highly accurate method for approximating integrals, and it is widely used in various fields such as physics, engineering, and mathematics. It is particularly useful for integrating functions over multidimensional spaces, which can be challenging to integrate using other methods.

5.4 Computer Problems

4. Use an adaptive Gaussian quadrature method to evaluate the integral.

5. Use an adaptive Gaussian quadrature method to evaluate the integral.

6. Use an adaptive Gaussian quadrature method to evaluate the integral.

7. Use an adaptive Gaussian quadrature method to evaluate the integral.

8. Use an adaptive Gaussian quadrature method to evaluate the integral.

9. Use an adaptive Gaussian quadrature method to evaluate the integral.

10. Use an adaptive Gaussian quadrature method to evaluate the integral.

Examples:

1. Evaluate the integral of the function f(x) = x^2 over the interval [0, 1] using Gaussian quadrature.

2. Evaluate the integral of the function f(x) = e^x over the interval [0, 1] using Gaussian quadrature.

3. Evaluate the integral of the function f(x) = sin(x) over the interval [0, π] using Gaussian quadrature.

4. Evaluate the integral of the function f(x) = ln(x) over the interval [1, e] using Gaussian quadrature.

5. Evaluate the integral of the function f(x) = x^3 over the interval [0, 1] using Gaussian quadrature.

6. Evaluate the integral of the function f(x) = x^4 over the interval [0, 1] using Gaussian quadrature.

7. Evaluate the integral of the function f(x) = x^5 over the interval [0, 1] using Gaussian quadrature.

8. Evaluate the integral of the function f(x) = x^6 over the interval [0, 1] using Gaussian quadrature.

9. Evaluate the integral of the function f(x) = x^7 over the interval [0, 1] using Gaussian quadrature.

10. Evaluate the integral of the function f(x) = x^8 over the interval [0, 1] using Gaussian quadrature.